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EDITORIAL NOTES.

The Drawbacks of the Half Year.

WHEN six months ago the Governor of the Gaslight and Coke Company (Sir Corbet Woodall) addressed the proprietors, he was optimistic as to the future; and he will be found so still when he comes to address the proprietors on Friday, as the accounts that he has to present, and the indications as to the outlook for gas business generally will justify a generous belief in the times ahead. Six months ago the overhanging clouds of definite form were coal and oil, while there was an uncertainty about the residuals markets, and about the factor, which never can be forecast, of weather conditions. If we eliminate from consideration for the moment the effect upon the gas consumption of the mild weather in the autumn, the general result found in the accounts before us is just about what Sir Corbet led the proprietors to believe would be the result of the six months' operations. The half year is really made to look more out of countenance as a normal half year than it would otherwise be by being, unfortunately for it, brought into contrast with a half year that was abnormal in more respects than one. True, in the six months with which comparison is made, coal and oil were at high prices, but not so high as in the half year just closed. But in that half year the selling prices of coke and sulphate of ammonia were higher, and the demand for the former greater; while the consumption of gas advanced by 7·26 per cent., or in volume by 920,126,000 cubic feet! We pity the half year just closed for having its trading results judged by contrast with such an exceptional period.

So judged, however, the balance of £522,710 on revenue account is £57,767 less than it was twelve months since; being attributable to the income of £2,472,020 being less than in the corresponding half of 1912 by £33,970, and to the expenditure of £1,949,309 being more by £23,796. The Board have set aside £15,000 to the redemption fund; but they have not added, as for the December half of 1912, £20,000 to the special purposes fund. After meeting interest and other charges for the half year, there remains, as a result of the trading, a profit balance available for the ordinary dividend of £302,243; but as the dividend at the rate of £4 17s. 4d. per cent. per annum will require £398,742, the sum of £96,499 will have to be taken from the undivided balance, which will then be £614,052, as compared with £712,387 twelve months ago. But when we find that the total cost of materials used in manufacture (£871,726) was £58,642 more than in the corresponding period of 1912, that the income from residuals (£591,490) was £7198 less—making the net cost of materials £65,840 more—and that the shrinkage in the consumption of gas through the mild weather was 1·78 per cent. as compared with the increase of 7·26 per cent. (the greater part of which has been maintained in the past half year), representing a reduction in the gas receipts (£1,636,369) of £35,462, there is no need to look further for an explanation as to the profit on the half-year's trading falling so far short of dividend requirements. No board of gas directors is omnipotent, no directorate can control the meteorological conditions, nor the markets for residual products; and the directors of the gas industry, combined with the directors of all other industries in the country, are powerless in the matter of coal prices in the hands of a comparatively few colliery proprietors. While the reduced gas consumption, the smaller demand for coke, and the break in sulphate prices are regrettable, they are not by any means matters to worry over so much as the coal and oil position.

Here we have the Company expending in this one half year £782,607, or £49,398 more on coal than in the second half of 1912, although (carbonizing 949,139 tons) 52,877 tons less were used for gas making, and 386,312,000 cubic feet of coal gas less were made—the total coal gas produced being 11,680,420,000 cubic feet out of the total quantity manufactured of 14,525,698,000 cubic feet. The balance of 2,845,278,000 cubic feet was carburetted water gas, which was an additional make of 254,330,000 cubic feet; so that the net reduction in the make of gas—coal and carburetted water gas—was 131,982,000 cubic feet. Therefore it may be taken that about one-fifth part of the 52,877 tons decrease in the quantity of coal carbonized is due to the lower total make of gas. From these figures it will be seen that there has been a partial reversion to carburetted water gas making during the half year—a reversion produced no doubt by the dual circumstances of higher priced coal and a tardy market for coke. The result of this was that 6,607,377 gallons of oil were used in the half year; being an increase of 801,219 gallons. On this oil £46,375 was spent, or an addition of £8946. For carburetted water gas, too, £42,744 was expended on coke and breeze, or an increase of £298. These figures supply the components of the additional cost of materials as already mentioned. But the position would have been much worse than it was in regard to the costs of materials had it not been for the excellent character of the working in the manufacturing department. The average make of gas per ton of coal was 12,306 cubic feet, as compared with 12,042 cubic feet in the corresponding half of 1912. Had the average make remained the same as in the second half of 1912, some 20,834 tons more coal would have been required for the quantity of coal gas produced in the past half year. The consumption of oil was 2·32 gallons per 1000 cubic feet of carburetted water gas made. The only feature about the working that is not so favourable is the increase of upwards of 95 million cubic feet in the unaccounted-for gas; but, of course, several causes may have contributed to this difference.

Comparing the details of the revenue account, the total expenditure under manufacture (£1,269,546) was greater by £51,096. It has been seen that the cost of materials was £58,642 more; and other increases were £3244 on purification, £4438 on repair and maintenance of works, and £279 on salaries. But to be deducted from these increases is a reduction of £15,510 on account of wages. The total distribution expenses amounted to £368,951—a recession of £19,326, of which nearly £10,000 is found under automatic gas-fittings; the remainder of the lessened expenditure being distributed between repair and maintenance of mains and services, and repair and renewal of meters and stoves. The charge of £161,105 for rents, rates, and taxes is £7849 less, which is something for which to be thankful. There are really no other changes on the expenditure side worth particular notice; but, with the variations in the items, the total expenditure for the half year—being, as already remarked, £1,949,309—shows an increase of £23,796.

The revenue from gas amounted to £1,636,369, or a reduction of £35,462 when compared with twelve months ago. But this, as previously pointed out, compares with an extraordinary half year, when consumption went ramping up. Contrasting the increase of that half year, of upwards of 920,126,000 cubic feet, with the reduction of 242,606,000 cubic feet in the past half year, the latter figure assumes at once a decidedly lessened importance. In their report, the Directors observe that the decrease is attributable entirely to climatic conditions; and so was a considerable part of the increase in the second half of 1912. More and more the gas industry is becoming subject, in regard to the volume of its primary business, to atmospherical conditions; and a supplementary tale in proof could no doubt be told by the Governor from the experiences during the cold weeks since Christmas. Though consumption returns in consequence of climatic changes may now be more pronouncedly vagrant than in times past, the true guarantee test for one to apply to the business ahead is the expansion of the connections; and in the past half year we find the number of consumers has been enlarged by 13,853, and of stoves sold and let on hire by 35,822. The rental of meters, stoves, and fittings has also extended by £8573—now totalling £238,344.

While this sort of thing goes on, gas proprietors need not view with the slightest alarm a backward jump in consumption; for, given favourable weather conditions, the jumps forward will be greater still in the future than in the past. The income from residuals amounted to £591,490; being a reduction of £7198. We are pleasantly surprised not to find the result in the aggregate worse than this. There was a less quantity of coke sold during the half year by 24,561 tons; and the receipts—£362,309—were £9158 less. The six months have not added to the quantity of coke in store, owing to the smaller amount of coal carbonized, and the larger use of coke for carburetted water-gas purposes—the quantity in store being, at Dec. 31, 92,222 tons, compared with 93,730 tons at the beginning of the half year. At the end of December, 1912, the quantity in store was only 26,400 tons. This tells a tale. But we anticipate that during the recent cold weather, and the strike of coal porters and carmen, the stock of coke has been somewhat reduced. In yielding £26,500, breeze brought in £986 more. Tar and tar products, however, saved the residuals account from a worse complexion by realizing £89,770, or an addition of £12,182. The depreciation of the market price of sulphate (owing to reasons already advanced in these columns) is reflected in the receipts of £112,910, which is £11,209 less than twelve months ago; but the smaller quantity of coal carbonized is partly responsible for this. The total receipts, as already mentioned, amount to £2,472,020, or a reduction of £33,970.

The general financial outcome has been treated upon earlier in the article. But the examination we have made of the accounts shows that the financial result of the half-year's trading is no index to the Company's stability. Previous trading enables it, and with much to spare, to stand the strain of exceptional adverse circumstances; and its potential position assures that, under favourable commercial conditions, it can and will surpass all previous records—good as the records have been during recent years.

The One Black Spot.

THERE is just one black spot in the half-year's accounts of the South Metropolitan Gas Company; but in regard to all other constituents, there is, despite an amount of disappointment in regard to one or two of them, much that must, considering all things, give a large measure of gratification to the proprietors. Careful scrutiny of the accounts makes it perfectly evident that there has been strenuous work throughout the half year on the part of all concerned to combat the prevailing hostile conditions; and the outcome is one that is a handsome tribute to administration, staff, and workmen. It is a deviation from normal circumstance for coke to be in such poor demand while coal is selling at such high prices; and a factor that in the past half year has made the position worse for gas suppliers (as they only too well know) has been the depression in the market value of sulphate of ammonia. Nevertheless, though coal alone cost the Company in the six months £466,090, or £70,826 more than in the corresponding period of 1912, the profit is only £58,840 short of the amount required to pay the statutory dividend, and this sum will have to be taken from the £123,511 which was brought forward from the previous half year. The word "only" is used deliberately, because the result might easily have been much worse, if a tight grip had not been kept on the residuals trading, and if the working generally had not been of the high order that is reflected by the financial and working statements. The £58,840 is, of course, a substantial sum; and there is good excuse for the keen feeling that permeates the explanation as to its causes that appear in the report signed, on behalf of the Directors, by Mr. Charles Carpenter, D.Sc. "The abnormal cost of coal is the sole reason for this deficit, "and is in great measure due to the unprecedented export "to the Continent, which has had the effect of seriously "handicapping many other British industries. A reim-"position of the export tax on coal would have a counter-"acting influence upon this undue inflation of home prices." Notwithstanding the defence and plea advanced on behalf of the coalowners—a defence and plea based only on personal fairness without any regard to the due of other people to have fairness meted out to them—we are in thorough accord with the Directors in their view, as was emphasized by our recent reference to the extensive increase in the coal exports from this country.

However, the £70,826 increase in the expenditure upon coal was reduced by an additional sum of £8183 received for residual products, which, in view of anticipations, is one of the pleasing features of the accounts. The total receipts under this head were £328,985; and though the Directors say that "except as regards tar products, the "prices realized from residuals have been disappointing, "production having been somewhat in excess of market re-"quirements," upon the aggregate figure there is cause for sound congratulation. Coke, of course, has been the residual chiefly in bad demand; but it is interesting to observe that, though sales of 222,692 tons of coke in the six months were 41,633 tons less than in the second half of the preceding year, the receipts (amounting to £199,324) were £7201 more. There is no question about the demand having been at a lower level, because, although the 557,553 tons of coal carbonized were 1521 tons less than in the corresponding half year, the huge piles of coke at the works—aggregating 70,037 tons at Dec. 31 last—were too substantial for suggesting an error in this direction. This quantity in stock is an unpleasant feature; seeing that the half year commenced with only 20,876 tons in store, and at Dec. 31, 1912, there were only 9673 tons in hand. But a division sum shows that the Company obtained a good average price per ton for their coke, considering the conditions of the market. Probably by this time they have reduced the coke stock; for they took the opportunity presented by the recent cold weather and strike of London coal porters to actively advertise the virtues of coke for domestic and industrial purposes. The £3805 received for breeze was a reduction of £397; but tar and tar products yielded a sufficiency in extra income to more than cover the reduction in the receipts for sulphate of ammonia—the sum of £54,277 received for the former being more by £7833, while the yield of £71,579 by sulphate was £6453 less. The diversity of the markets in which the gas industry operates has again been an advantage to it; for had market values through the whole range of commodities dealt in dropped in sympathy the one with the other, the financial results of the half year, with coal at the price ruling, would for many concerns have proved somewhat disastrous.

Helpful to the Company, too, has been the working at the stations. It has been shown that 1521 tons less coal were carbonized; but from the reduced quantity of coal 7,099,900,000 cubic feet of gas were made, or 114,831,000 cubic feet more. This make is equal to 12,734 cubic feet per ton, which, we believe, is a record for the Company. In the corresponding period of 1912, the production per ton was 12,494 cubic feet; so that there has been an improvement of 240 cubic feet per ton, which has materially helped the Company, by not only meeting the increase in the sale of gas, but by saving 1521 tons on the coal consumption of the second half of 1912. Or to put the improvement in working another way, had the production of gas remained at the average per ton of the period with which comparison is made, the extra coal required to meet the additional demand for gas would have been 10,712 tons. There is rather a notable point about the increase in the consumption of gas, which (the total sale being 6,632,033,000 cubic feet) amounted to 102,055,000 cubic feet, or 1·56 per cent, which surmounts the increase of 6·21 per cent. in the second half of 1912. "This increase," the Directors remark, "cannot "be regarded otherwise than as satisfactory evidence of the "sustained popularity of gas, especially when it is remembered "that the Company's area of supply has remained unextended "for thirty years." "Unextended," not unchanged.

Turning to the receipts for gas, we see a notable point. The income from gas was £690,359—showing an increase of £10,428. The receipts from public lighting remained practically the same—only £83 more. For the Michaelmas quarter, there was an actual reduction of £66 in the receipts from private sources; but in the Christmas quarter the increase obtained from the private consumers was £10,411. Owing to the mildness of the autumn, several undertakings then experienced a decline in consumption compared with the similar period of the preceding year; but the figures show that the autumn was very kindly disposed to the South Metropolitan Company. However, the extension of custom is proceeding in a very marked manner, which is the best possible assurance, subject only to atmospherical conditions, against business relapses. The meter, stove, and fittings rental in the half year was £128,330; being £9791 more than in the second half of 1912. Ordinary gas-meters—numbering at the close of the year 95,754—have slipped back 144. But to set against this is an increase in

slot meters of 6008, to 269,921; an increase in ordinary stoves of 1594, to 82,807; an increase in slot stoves of 6028, to 223,488; and an increase in gas-fires on hire of 6231, to 44,540; while the rental from fittings alone was augmented by £6748, to £49,817. This is a healthy condition of things. It is also noteworthy that, with 365,675 meters fixed, there are 306,295 cooking-stoves in use. The open field for gas-fires (the figures quoted do not include private possessions) is an enormous one.

This review shows the one black spot on the half-year's accounts, and the splendid achievement in lessening the effects of the heavy price of coal. There is little else to say about the accounts. Running over the expenditure items in the revenue account, it is seen that the total manufacturing costs amounted to £676,501, or £48,130 more. In addition to the higher cost of coal, the item of salaries was supplemented by £1318. But purification costs receded by £3526; carbonizing wages by £609; and repairs and maintenance of works by £19,879. Regarding purification, the information is given that the nickel process of purification from sulphur compounds, after being thoroughly proved at the Old Kent Road works, is being rapidly extended at the other chief manufacturing stations; and that, "at no distant "date, the bisulphide impurity, the removal of which had "baffled engineers and chemists for three-quarters of a "century, will be completely eliminated from the whole of "the gas supplied by this Company." The use of the word "had" in the quoted sentence is expressive of unqualified confidence, the foundation for which is supplied by the paper that Mr. Carpenter read before the Société Technique du Gaz last June [see "JOURNAL" for July 1 last, p. 30]. As to the other items of expenditure, £20,000 is allocated to co-partnership—£4000 more than in the second half of 1912. Distribution cost £191,142, or £5174 more. In the constituent items, there is a general tendency upwards, save in the entry repair, maintenance, and renewal of mains and service-pipes, which is down by £3582. Among the other items, there is noticed a decrease of £1785 on rates and taxes; and a striking reduction from £13,261 to £6095 in the charge under the heading of superannuation, sick, and accident funds. The income side of the account has already been reviewed. The final result of the half-year's trading is this: The total expenditure was £996,667, or £51,058 more. The receipts amounted to £1,149,130, or £28,363 more. The difference between the increase in expenditure and the increase in income is £22,695, which is the sum by which the £152,463 transferred to the net revenue account is below the sum so transferred twelve months ago. Had there not been the addition of £70,826 to the cost of coal, the financial result of the half-year's trading would have been an excellent one.

Official Testing of High-Pressure Meters.

ATTENTION was directed last week to the proposals of the London County Council and of the Corporation of the City of London to bring before Parliament, in the ensuing session, the question of the testing of high-pressure gas-meters. Since then we have had an opportunity of giving further consideration to the matter. The more it is thought over, the more convinced are we that this is not a question that should be dealt with piecemeal, but that it should be made part and parcel of a thorough revision of the general legislation governing the testing and stamping of gas-meters, the proper body for taking up which is the Board of Trade. Tests for high-pressure meters will undoubtedly have to be prescribed before long. But should the Bills be passed that have been deposited, we should, in the first place, have the anomaly of the testing and stamping of high-pressure meters being in force in the Metropolitan area only, with the remainder of the United Kingdom free from such legislation. In other words, while unstamped meters would be prohibited in London, throughout the rest of the British Isles the installation of stamped ones would not be obligatory. The Board of Trade no doubt see the absurdity of this; and perhaps they will intervene, with the view of themselves, when prepared, taking up the matter, after proper inquiry at which a qualified representative appointed by the Board could hear the evidence of meter experts. Anyway, it is hoped that, if it is not decided to defer the whole question until there is a general revision of the enactments affecting meter testing, the two Bills that have been lodged will not be allowed to proceed until the parliamentary authorities have heard the evidence of the meter makers and, if thought necessary by the London Gas Companies, evidence on behalf of gas suppliers. The London County Council appear to be the prime movers in this matter of suggesting legislation for the testing of high-pressure meters; but the Corporation of the City, we rather think, are not at all particular at the present time over the projected legislation going forward, save on the score of uniformity of practice in the Metropolitan area. In point of fact, the County Council themselves are only making a move in the matter, because the Board of Trade are not contemplating doing so at the present time.

There is another point. It seems to us somewhat premature to prescribe just yet anything definite for the testing of high-pressure meters. There are only two or three on the market at present; and these are the initial ones. High-pressure meter making is quite a new business. It is open to us therefore to anticipate, and to hope, that finality has not been reached in the design of the means of measuring gas supplied at high pressures; and a little delay until there is more experience and investigation cannot do any real harm to anyone. It may be expected that the Board of Trade will before long be taking up the whole question of the amendment of the Sales of Gas Act, and then provisions relating to high-pressure meter testing, after full inquiry, could well be incorporated in the revised, and one, measure. The Sales of Gas Act cannot go on much longer without revision; for the testing of ordinary meters at 5-10ths of an inch is altogether out of touch with the conditions of to-day. Incidentally, it may be remarked that there are some people who think it would be a good thing for both undertakings and consumers if, when taking in hand the revision of the Act, the seal was only made valid for a certain number of years, in order to ensure the re-testing and overhauling of meters, and so maintain their accuracy. There are gas undertakings that do take out meters periodically for overhauling and examination; while other concerns allow their meters to run on almost indefinitely without ever troubling about them. Of course, it would be a big and costly thing for the large undertakings to be compelled to take out their meters at too short intervals for testing, though, on the other hand, there would be some compensation in the saving in unaccounted-for gas, which is all too heavy in the case of some concerns, and is not all traceable to the subterranean distribution system.

This, however, is a digression from the main subject. Reverting to the high-pressure legislation proposed by the two London authorities, there are at the moment perhaps three main points of objection which should be reconsidered, in the event of the progress of the Bills not being objected to by the Board of Trade. There is, in the first place, a clause providing for each meter being fitted with a suitable gauge by which the consumer may ascertain the pressure of the gas. There does not appear to be anything particularly useful about this provision; for we doubt very much, from what we know of gas consumers, whether users of high-pressure gas would trouble their heads to any degree about reading a pressure-gauge. The gauge would have to be a mercurial one; and, of course, it would have to be provided if legislated for. But it does not appear to be a very fair thing to make such a gauge an integral part of the meter—or rather to impose upon the meter makers responsibility for the accuracy and the soundness of an accessory which is not an essential part of a meter, and which would be external to the casing, and consequently unprotected and so exposed to damage and manipulation. The makers of high-pressure meters do not necessarily manufacture high-pressure gauges, and probably would not desire to go into the work of producing such highly specialized appliances. If, however, the clause were altered so that the consumer was made responsible for the gauge, and it was not statutorily reckoned as part of the meter, and a meter could be stamped without it, of course there would not be the same objection.

The second objection is found in the rules proposed to be prescribed for the testing of the meters. Previous to the rules, a provision is found to the effect that "the meter "shall be so designed and constructed as to ensure that, "when the supply of gas to such meter is turned on or off, "there shall be no undue strain upon the mechanism of the "meter." That is all right. But what does not appear to us to be right is the subsequent test for soundness or leakage. For this test it is proposed that "gas shall be passed "into the meter under a pressure equivalent to *double* the "pressure or maximum pressure at which the meter is con-"structed to be used." The outlet of the meter is to be

closed; and, "if there is any leakage or defect in the meter "whereby gas escapes, the meter shall be deemed to be "unsound, and shall not be stamped." Then gas is to be again passed into the meter under a pressure equivalent to the maximum, and it is to be allowed to pass out at the rates according to the quantity of gas per hour the meter is intended to measure. Succeeding are the tests for correct measurement and percentage of error. Going back to the test for soundness, double the maximum pressure at which a high-pressure meter is constructed to work is certainly unreasonably high, and would unquestionably put a detrimental strain upon the casing of the meter, the effect of which might be disclosed in an uncomfortable manner after prolonged exposure of the casing to the specified working pressure. What the strain of such a test would mean to the meter structure we do not at present know. But doubling the maximum pressure does not commend itself to us as being fair to the meter, to the makers, nor to those inspectors who have to stand the risk of making the test. Surely a test pressure (say) 25 to 30 per cent. in excess of the maximum pressure the meter is intended to work at would be quite sufficient for the purpose of determining the soundness of the casing.

The third point is the question of expense. The makers of high-pressure meters have themselves to make elaborate works' tests; and these they would still have to conduct before sending the meters away for official testing. The official station would have to be equipped with expensive plant for the purpose of testing the meters; and the several official tests that it is proposed to carry out at various pressures would, of course, mean fees, all adding to the cost of the meters. The expense of all this testing would fall upon the purchasers of meters; and in the present stage of the high-pressure supply business and of high-pressure meter making, it is not advisable to augment the costs falling upon the consumer. Anyway the matter could well stand over until consideration is given by the Board of Trade to the amendment of the Sales of Gas Act, and so make one "job" of the whole question of the official testing and stamping of gas-meters, both high and low pressure.

Chaos in Trades Unionism.

THINGS are not proceeding in the world of labour as the extremists, and those who profess and call themselves Syndicalists, or other names more or less odious to intelligent men, would like. Chaos rules, and discontent is spreading. Events are going strongly against the unions and their policy as directed by the new school of advanced agitators, and the respect is losing strength that was once held by the public for the union of labour for legitimate defensive purposes, and for using justifiable means for promoting the interests of workers. The public realize that trade unionism is now, by the tactics adopted, attempting to obtain compliance with its demands through and by the coercion of the body politic; and the public are not taking kindly to playing the *rôle* of catspaw (and suffering in consequence) to combinations led by demagogues or fanatics of the order of many of those who have engineered some of the more recent strikes. The country is heartily sick of the perennial unrest, and are tired of the men who are mainly responsible for it. Another thing that the general public despise is the violation of their working agreements by the men. Heavy sums are annually spent on education, and in displacing ignorance by knowledge. But the phenomenon presents itself that, as education advances among the people, honour in the militant sections of trade unionism appears to recede, and agreements and contracts are torn to pieces and flung to the four winds with the indifference that one would show for a piece of waste paper. Some of the labour wirepullers are very strongly opposed to the rank-and-file of the unions breaking loose, and taking action in the manner that has frequently been seen of late, without the endorsement of the leaders. But for this some of the leaders are to blame; for they have themselves created a new standard of militarism among the rank-and-file which has made the latter reckless of discipline, and more active in showing resentment. The men have been told that labour can fashion things just as it pleases, if it only goes by combination the right way to work, and ejects all notions as to individual responsibility and honour. The teachings of the extremists are recoiling upon them. The men have been taught that they are quite within their right in summarily destroying contracts with their masters, if they can by so doing bring about a *coup d'état* in settling a demand or claim; and the men fail to see why the same teaching cannot be by breaches of discipline applied to union leaders as well as to masters. Many instances of the ignoring of the leaders by the rank-and-file have been witnessed of late years; and we believe that it is partly because of this, and the degrading of the authority of the leaders, that so many strikes have of late been engineered by the latter, in order, among other purposes, to demonstrate action as well as incessant vapouring, which after a time palls.

But a new order of things has arisen; and the union leaders have had the mortification of seeing their strike schemes spoilt, and they themselves made the object of personal ridicule, by the defeats successively sustained. They will not brook arbitration or conciliation intervening between them and the policy of collective militant action. They foresee the power of the unions waning if they do this, and their own present easy and cosy billets jeopardized. But while they have been sowing the seeds of an eruptive policy, and creating a false dissatisfaction among the general members of the unions, those against whom they are actively operating have also recognized that there is strength in union. The public, as has been seen, are weary of the extravagant claims of the unions, and tired already of the new methods of trying to gain their ends by the production of general disorganization. The public have turned, and are showing hostility. The masters themselves have banded themselves together; and by firmness and unity in resisting unfair claims and the continuance of impossible conditions, which interfere with the peaceable prosecution of their businesses, they are doing very excellent work in putting the trades unions back into their legitimate place, in confounding the new school of arbitrary labour demagogues, and in undermining the belief of the less intelligent of the men in their new-found leaders, whose mastery of vituperation and whose capacity for boasting of almost superhuman power appear to be their only qualifications for presuming to act as leaders of men—the philosophy of a broad diplomacy in dealing with affairs in which the interests of two and even three parties are concerned being altogether foreign to their understanding. The masters have had enough of these men; and, while not opposed to the union of labour for attaining legitimate ends by rational means, they are tired of dictation, the want of observance of agreements, and extravagant claim. As a result, the union leaders' boasts and reckless counsels are being wrecked here, there, and everywhere, on the rocks of combination and firmness on the side of the employers.

Leeds and Blackburn hold their lessons as to what can be done against over-arrogant unionism by a resolute governing body, backed by public opinion. South Africa has supplied a lesson of what can be done by meeting the drastic action of the Syndicalists by drastic action on the part of the Government. The strike in London of coal porters and carmen has come to an ignominious end for the unionists, simply by the cohesion of the masters and the strength of public opinion against the high-handed proceedings and edicts of the leaders of the unions. The way men broke away at the very first signs of defeat from the ranks of the strikers and returned to work is the best indication of the want of any sincerity or depth of feeling as to the righteousness of their claim. The huge combination of London builders is face to face with a more imposing task; for they have to deal with an important combination of many unions and trades, from all of which the building firms have to draw their labour. But the masters, again by cohesion and firmness, we believe are going to win, and the unions concerned will find themselves with reduced funds and power. The public are also with the masters in this case. There is a vital principle involved in the dispute. The masters have reached the length of their power of endurance, and are resolved to have no more of the disturbances to which they have been subject for so many years on the most frivolous of pretexts; equally resolute are they on the subject of being free to employ non-unionists and unionists alike, and that the former shall be allowed to work without molestation. The mode by which the masters have collectively determined to gain their end is by treating with each man separately by what is known as the "Peace and Penalty" agreement, under which the master would be entitled to deduct from wages due a penalty of £1 for any infraction of the contract by the individual. The refusal to sign the agreement led to the men discharging themselves, which it appears (subject to appeal) has put those who come under the

unemployment section of the Insurance Act out of court in respect of benefits. The weakness of the men's position is obvious. If they have any intention to comply honourably with the terms of their contracts, then they can have no objection to the individual penalty for violating their contracts; for there would never be any call to exact it. But the men preferred to discharge themselves rather than sign the contract. The masters have the strongest justification, in past experience, for taking every possible means for ensuring honourable compliance with contracts on the part of the men; and—now that they see the determined attitude of the masters, and now that there are dim outlines as to what will befall many of the men if the masters simply sit tight and make a clean job of this matter of enforcing honesty to obligations and maintaining their own independence on the subject of labour irrespective of unionism—not a small proportion of the men appear inclined to give way rather than continue loafing about on a much curtailed income.

Altogether, the ultra-militant labour leaders are not at the present time pleased with the rank-and-file of the unions; in face of the ill-successes of the trade union policy, the rank-and-file are not particularly pleased with their leaders; and the leaders who have assembled in Glasgow to confer on the parliamentary position are not all gratified with the character of the work done by the Labour Party in the House of Commons, and have forcibly delivered themselves on the subject. So chaos rules in the world of trades unionism; and to extricate them from the chaos the unions want men of intelligence and balance, and not men of the firebrand order.

Supply of Yorkshire Out-Districts.

The gas undertakings in Yorkshire had better look into the proposals of the Yorkshire Electric Power Company regarding the supply of electricity for lighting purposes to all areas at present without a supply. The Company have a Bill in Parliament for authorization, and are canvassing the local authorities concerned for support. Several of the Councils want further information on the subject before committing themselves to give their adhesion to the Company; some are against being parties to conferring on the Company a monopoly of electric lighting; others are sitting on the fence, and do not care much what happens. In view of this, there should be a good development of gas-service in the out-districts that have been lying dormant in this matter. Where powers exist, supply can be developed early; and, from the strategical point of view, being there first is worth something.

The No. 2 Burner for Mossley.

The Corporation of Mossley have not been kept very long in suspense regarding the result of their application to the Board of Trade for sanction to the adoption of the "Metropolitan" No. 2 burner for testing purposes, in place of the "London" No. 1 burner, which was specified under the Stalybridge Gas Act, 1884, with the qualification "or any other burner which they may from time to time adopt with the approval of the Board of Trade." There was an opponent to the proposal—not on the score of any shortcomings of the new burner—in the shape of the Saddleworth Urban District Council, whose area is dependent upon Mossley for a supply of gas. There are matters in regard to which the Saddleworth authorities think themselves hardly treated; and here was an opportunity to make their grievances known, if not to get the redress to which they look upon themselves as entitled. The result was the very full inquiry, a report of which appeared in the last issue of the "JOURNAL." Quite a substantial list of concessions were suggested by Saddleworth, as a set-off against the new burner—indeed, it was so substantial that the Corporation were unable to agree to it. During the inquiry, the Presiding Officer of the Board made it clear, too, that nothing but a plain assent or refusal could result from the inquiry, and that there would be no conditions imposed. In view of the large number of undertakings that have already secured the new burner, and the fact that its accuracy was not impugned in the present instance, there appeared little reason to doubt that the Board would approve of its adoption by the Corporation of Mossley. This they have now done; and the sanction has been granted (as was stated would be the case, if it were granted at all) without any conditions being imposed. The Mossley Corporation, however, as was mentioned in the course of the inquiry, agreed to use the Harcourt ten-candle pentane lamp instead of candles as the light standard; and they also expressed their willingness to convert a number of flat-flame lamps to the incandescent system for the Saddleworth Council—the expense to be borne by the Corporation.

Flue Ventilation and Heating Efficiency.

The persistent investigation that is being made as to the action in operation of different constructions of gas-fires serves to broaden knowledge as to actualities, and what is also of importance to limit the scope for "jumping to conclusions." Mr. W. J. A. Butterfield, M.A., F.I.C., in his own private laboratory, and with an "Apollo" and a "Mascot" fire, has been making research into the relation of flue ventilation to heating efficiency; and the results supply us with an interesting article from his pen in other columns. The results further abundantly justify the attitude originally taken up in the "JOURNAL" in regard to this question. By his investigation, Mr. Butterfield found that a "Mascot" fire required 21 inches vertical length of elbow and flue-pipe to make it the equivalent of an "Apollo" fire without elbow or flue-pipe, so far as the removal of products of combustion from the room in which it was used is concerned; and, under these conditions, the flue-gas losses of the two fires were comparable. With a gas of a net calorific value of 485 B.Th.U. per cubic foot, the "Apollo" fire carried off the whole of the products of combustion by way of the flue-vent with a minimum flue-gas loss, while the "Mascot" fire, fitted with a flue-pipe, did the same, only with a flue-gas loss somewhat higher. The effect of putting an elbow on the "Apollo" fire was to reduce considerably the difference between the flue-gas losses of the two fires; but the "Apollo" continued at all points to show a much smaller flue-gas loss than the "Mascot." Generally, it was shown by the tests that the "Apollo" type of construction involves no loss of radiant efficiency, but an increase in the heating of the room by convection, with a reduction in the heat losses by way of the flue-pipe when the fires are used under like conditions. This brief indication as to the findings in this investigation by Mr. Butterfield will ensure a critical study by readers of the details and information incorporated in the article.

Strange Bedfellows.

Among the Provisional Orders which have been deposited with the Board of Trade, and which are reviewed in other columns, are two that propose to introduce something new into gas-supply legislation. We have for some years had acetylene gas supplied at Portsoy under statutory powers; and there is statutory authority for the distribution of coke-oven gas. Two or three gas undertakings have also power to supply petrol gas and acetylene plants to buildings beyond the range of the ordinary gas distribution system. But among the Orders for this session is one proposing the distribution, under statutory authority, of petrol gas to Balcombe; the gas having a standard illuminating power of 35 candles Another Order—the Calvert (Charndon) one—makes provision for the supply of natural gas to Twyford and Charndon, in Buckinghamshire.

The District Fund and the Maximum Price.

We are by a provision in the Bourne District Council Gas Order reminded of the Limerick case, in which it was held that the local authority should not persistently have recourse to aid from the general rates for their electricity supply undertaking so long as there existed a margin between the price charged for electrical current and the maximum authorized. The Bourne Council are proposing to take over the gas supply in their area; and they are suggesting a maximum price of 5s. 6d. per 1000 cubic feet. Among the clauses is one stipulating that "the Council shall not defray any of the charges and expenses of carrying this Order into execution, other than payments required to be made in respect of money borrowed on mortgage of the district fund and general district rate, out of that fund or rate when the price of gas to private consumers is less than 5s. 6d. per 1000 cubic feet." The Local Government Board ought to supplement this with a provision preventing the transfer of gas profits in aid of the rates; and one protecting ratepayers by ordering that if under unusual circumstances any payments are made in support of the gas undertaking from the district fund or rate, they shall be reimbursed. Then the Bourne gas finances would be on quite correct lines.

Discs and Prepayment Meters.

It would be absolutely opposed to the principle of prepayment if gas undertakings generally recognized the employment of discs in slot meters. Discs are now and then used; but it is rarely one hears of any trouble regarding the matter, as gas undertakings are rather disposed to look with a lenient eye on the occasional, though not habitual, use of discs, when dealing with an honest poor consumer who has the money ready to exchange for the tokens when the collector empties the meter money-box. But it would never do to countenance the habitual use of discs, or a considerable debt account would accumulate, and the gas suppliers would be put to an immense amount of inconvenience and expense in recovering the money (all which the prepayment is intended to avoid). A case of importance to gas undertakings generally regarding the use of discs by slot meter consumers is pending in Manchester. It has been before the Stipendiary at the Manchester City Police Court; and the woman against whom action has been taken has been committed for trial to the Assizes, in order to have the legal aspects of the matter thoroughly thrashed out. The case being *sub judice* we cannot comment on it. But simply in order that there may be no mistaken notion as to any undue harshness in the action that has been taken, it may be mentioned that the woman concerned (so the evidence shows) had been warned against the use of discs, which appears to have become a habit with her, but the caution went unheeded. The fact that discs had been redeemed by her on previous occasions is rather an evidence of former leniency on the part of the Manchester Gas Department than any justification for continuing the practice after warning had been given. Originally the charge against the woman was preferred under the Larceny Act, but it has been altered to one of obtaining credit by fraud under the Debtors' Act. The report of the Police Court proceedings in our "Legal Intelligence" will supply the details of the case.

Gas Stokers' Wages.

Considerable pains have been taken in the compilation of a series of tables by the Labour Statistics Department of the Board of Trade, dealing with standard-time rates of wages and hours of labour in the United Kingdom at Oct. 1 last. Standardization in these respects has, of course, been secured to a much greater extent in some industries than in others; and it has been found that, while in many occupations there are wide variations in the wages and hours of different workpeople in the same district, in other trades there is a considerable degree of uniformity. All sorts of occupations are included in the statistics; and among the number is a table giving particulars with regard to the hours and rates of pay of gas stokers. The information given is what has been supplied by the companies or local authorities owning the particular works referred to. But, of course, only some of the principal towns are quoted; and with regard to all the tables in the volume emphasis is laid on the fact that the returns are not necessarily in all cases the rates and hours actually predominant in the trades and districts covered. As to the figures for gas stokers, these are given for twelve districts in London, eleven towns in the Northern Counties and Cleveland, thirteen in Yorkshire (except Cleveland), twenty in Lancashire and Cheshire, eleven in the Midland Counties, four in the Eastern Counties, nine in the South-Eastern Counties, five in the South-Western Counties, five in Wales and Monmouth, nine in Scotland, and seven in Ireland. The rates of pay, as shown, are good; and no doubt in a number of cases additions have by this time been made to the scales operating when the returns embodied in the report were prepared. The figures vary, as labour is cheaper or dearer in the district concerned; but it is noticed that in a fair number of instances the rate of pay per shift touches, or exceeds, 6s. Perhaps the most striking feature of the table is the proof it affords of the extent to which the eight-hour shift is now practised. In all, there are only 23 cases where this system does not prevail, out of the 106 works named. Of the exceptions, all but seven worked twelve-hour shifts. Time-and-a-half seems the usual scale of remuneration for Sunday work; but in some cases (including all the London district, with the exception of the south-eastern portion) double time is paid.

Last Thursday, Bro. C. J. Farrand, the Manager of the Havant Gas-Works, was installed W.M. of the Chine Lodge at Shanklin.

PERSONAL.

Mr. A. Mitchell, the Manager of the Kettle Gas-Works, has been appointed, out of about forty applicants, Manager of the Leslie Gas-Works, in succession to the late Mr. George Graham, whose death was announced in the "Journal" for Jan. 20.

Consequent on the resignation (noticed last week) of the Secretary and Manager of the Sutton Gas-Works, the Directors have made temporary appointments—for three months—to the two offices, now to be held separately; and Mr. J. Ferguson Bell, of Derby, has been selected by the Board as Consulting Engineer to the Company.

The Birmingham Gas Committee, in the report which they will present to the City Council to-day, mention with regret the death of Mr. Henry Hack, late Engineer-in-Chief to the Department, who retired from the service of the Corporation on June 1, 1908. They state that they have placed on record their appreciation of the very valuable services that were rendered by Mr. Hack during his 36 years' service.

Last Tuesday Mr. Henry Gilbert Smith-Rewse, nephew of Mr. Smith-Rewse, the Chairman for many years of the Whessoe Foundry Company, Limited, was married at St. Bartholomew's Church, Ipswich, to Miss Bridget Anne Montgomery Cuninghame, youngest daughter of the late Sir William Montgomery Cuninghame, Bart, V.C., of Kirkbride, Ayrshire, and Elizabeth, Lady Montgomery Cuninghame, of Edge Hill, Ipswich.

Mr. J. F. Tyndall, the Resident Manager of the Wicklow Gas-Works, has been appointed, out of nearly a hundred applicants, Manager of the Whitchurch (Salop) Gas Company, and will take up his duties on the 1st prox. Mr. Tyndall is just completing seven years' service at Wicklow, and before going there he was Assistant at the City of Waterford Gas-Works. He received his training, under Mr. Isaac Carr, in the Gas and Water Department of the Widnes Corporation, where he was engaged for something like eleven years.

An interesting ceremony took place at the Municipal Buildings, Reigate, on Monday evening last week, when the honorary freedom of the borough—the highest distinction the Council could bestow—was conferred upon Mr. Frederick Budgen, J.P., the Chairman of the Reigate and Sutton Gas Companies, "as a small, and quite inadequate, recognition of his long and faithful devotion to public work." He was also presented with an album beautifully bound in blue morocco; the cover being embellished with a copy of the borough seal in silver gilt. Mr. Budgen recently retired from the Council, after serving upon it for thirty-seven years. He is the borough's first honorary freeman.

Mr. J. B. Fenwick, of Cleckheaton, has been appointed Engineering Assistant to the York Gas Company, applications for which position were invited in the "Journal" for the 6th ult. Mr. Fenwick is the eldest son of Mr. J. B. Fenwick, the Gas and Water Engineer to the Retford Corporation, and served his apprenticeship with Messrs. Jenkins and Co., and was afterwards with his father at Retford. He was engaged with Drakes Limited, of Halifax, for five years; and, he left them to go to Cleckheaton, where he has been engaged for the past two years, under Mr. Arthur J. Jennings, the Gas Engineer and Manager to the Urban District Council, in the preparation of drawings and specifications for complete new gas-works now in course of construction.

OBITUARY.

The death occurred on Friday, as the result of a seizure a few days previously, of Mr. James Pilkington, the Chairman of the Gas Committee of the Oswaldtwistle Urban District Council. Deceased was only fifty-four years of age.

Mr. John Burnett, formerly Chief Labour Correspondent of the Board of Trade, died suddenly last Friday while out walking at East Putney. He received his appointment from Mr. Mundella in 1886; but in 1893 the newly-created branch of the Board was developed into the Labour Department.

The death of Mr. Edward Lister, who for 49 years was Secretary and Manager of the Yeadon and Guiseley (Yorkshire) Gas Company, removes from the district a figure which was very well known. Mr. Lister, who was 78 years of age, was formerly a member of the old Yeadon Local Board, and was prominently identified with local political activities in the Liberal interest.

The death occurred suddenly on the afternoon of Sunday, the 25th ult., of Mr. Robert Cowie, the Manager of the Tillicoultry Gas Company. He was in his usual health in the early part of the day; but in the afternoon, while preparing to go over to the gas-works, which are only a short distance from his residence, he was seized with faintness, and died in the arms of one of his sons. Heart failure was the cause of death. Mr. Cowie, who was a native of Grangemouth, went to Tillicoultry from Cambuslang, about thirty-three years ago, in succession to the late Mr. Frank Scott, as Gas Manager; and during the years intervening he carried out many improvements in the works and distributing plant, and effected changes which led to an extended use of gas. He was the trusted engineer and adviser of the Company, and one of the oldest and most respected members of the North British Association of Gas Managers. He was held in high regard in the

gas profession, as well as by his fellow-townsmen. He is survived by a widow, three sons, and two daughters, to whom much sympathy is extended in their sudden bereavement. The funeral took place at Tillicoultry Cemetery last Wednesday.

DEPARTURE OF MR. J. N. REESON.

Tokens of Appreciation.

At noon last Friday, on board the *Orama*, Mr. J. N. Reeson, Mrs. Reeson, and their son Mr. D. O. Reeson, left for Australia, where, as readers already know, Mr. Reeson is to occupy the position of Chief Engineer to the Metropolitan Gas Company of Melbourne. They take with them the best wishes of all who know them, and, in addition, much tangible evidence of the affection and esteem in which they are held on this side. Mr. Reeson, in his position of Resident Engineer at Beckton, made many friends, both locally and in other departments of the Gaslight and Coke Company; and there were numerous leave-takings, accompanied by handsome gifts, which will be pleasant reminders to him and Mrs. Reeson, in their new sphere, of those they have left behind them in the Homeland.

On Friday, the 23rd ult., at Horseferry Road, Mr. Reeson took an official farewell of the Directors of the Company; and he was on that occasion presented by the Governor (Sir Corbet Woodall, D.Sc.), on behalf of the Court, with a pearl tie-pin and studs, while for Mrs. Reeson there was a platinum and diamond wrist watch. High tribute was paid by the Governor, in making the presentation, to the good work performed by the recipient during his long association with the Company; and graceful acknowledgment was likewise made of the assistance rendered him in the social side of this work by Mrs. Reeson. Two days earlier there had been a farewell dinner (presided over by the General Manager, Mr. D. Milne Watson) at which Mr. Reeson was entertained by the chief officers of the Company, on whose behalf Mr. Thomas Goulden, the Chief Engineer, asked his acceptance of a despatch box and cabin trunk, and of a pendant for Mrs. Reeson.

The last day of Mr. Reeson's official connection with Beckton was marked by the presentation to him by Mr. Thorman, on behalf of the engineering staff there, of a gold cigarette case; and subsequently, at the request of the employees, he revisited the works, to receive tokens of their esteem. This time the presentations were made by Mr. T. S. Lacey (late of Nine Elms), the new Resident Engineer at Beckton. For Mr. Reeson there was a suit case with silver fittings and a gold match-box, for Mrs. Reeson a silver bag and cabin trunk, and for Mr. D. O. Reeson a suit-case with silver fittings. Mr. Lacey voiced the very deep regret felt at having to part with one who had proved himself to be a friend to them all. He said he had known Mr. Reeson and the family all his life. Their fathers were both old officers of the Company; and they had been closely connected with one another in their associations with the undertaking and in their personal friendship. In the last few years Mr. Reeson had had an arduous task to perform at Beckton; and very few men would have had the physical constitution, let alone the ability and the energy, to carry out the extraordinary amount of work that he had done. He was leaving the works at a time when they were in a better position than they had ever before been. In returning thanks for the gifts, Mr. Reeson remarked that in accepting the offer to go to Melbourne, he had had to harden his heart to a great extent. Not only was he leaving his friends at the works, but he was leaving, and his wife was leaving also, parents who were very dear to them. Whatever happened in the future, he could assure them that he would never forget the kindness they had shown him.

Still one other function must be mentioned. On Saturday, the 24th ult., three groups of the employees—the "C" Company of the Twelfth Battalion of the County of London Regiment, the Ambulance Brigade, and the Rifle Club—held their annual dinner. This date was about a month earlier than usual; and it was so arranged in order that Mr. Reeson might be accorded a hearty send-off. Sir Corbet Woodall presided, and distributed the prizes. Following upon this a presentation was made to Mr. Reeson by Superintendent Boxall, in the name of the members of the "K" Division (Metropolitan Police) Rifle Club. It consisted of a handsomely framed illuminated address, expressing appreciation of the recipient's great interest in the club. Reference was made by the Superintendent to the encouragement that Mr. Reeson had given to the police to take up miniature rifle shooting; and Mr. Reeson, in response, admitted that rifle shooting had been to him for some little time a matter of considerable interest. The Governor, in welcoming Mr. Lacey to his new position, said they wished him every possible success, and that he might be able to carry on the work at Beckton as it had been done by Mr. Reeson, and win the hearts of all of them as Mr. Reeson had succeeded in doing.

In addition to the presents already mentioned, others came from Beckton, which show how wide is the circle of friends that Mr. Reeson has made for himself in the locality. For instance, the Beckton Poultry Club gave him a case of pipes; and the Primitive Methodists there, a Bible. Then the Ambulance Class at Beckton presented Mrs. Reeson with a wallet; while Mr. Reeson received various personal gifts from different officers and men at the gas-works. Truly, they can wish for nothing better than to find as many friends in Australia as they have left behind them here in England.

ELECTRICITY SUPPLY MEMORANDA.

The half-watt lamp is still the subject of much random talk in electrical circles. Another batch of communications from electrical engineers on the subject of the prospects of the lamp has been published by "Electrical Engineering; and the answers show that in the past the high-pressure gas-lamp (as, of course, we generally knew was the case) has in towns large and small been a terrible thorn in the sides of the managements of electricity supply undertakings, who have not been able, with flame arc lamps, to stop the flow of its popularity. How they are now going to kick high-pressure lighting off the face of the earth with the more expensive half-watt lamp has yet to be demonstrated. But the fact remains that—notwithstanding the total costs of the half-watt lamp, its relatively short life for such an initially expensive unit, and the enormous disadvantage it possesses in the shape of an exceedingly high intrinsic brilliancy—electrical engineers (if their words are really representative of their convictions) do believe that the lamp is going to work miracles for them. There is to be no more sorrow over gas ousting high-power electric-lamps; no more cutting of prices, on the part of the electricity suppliers, to a profitless point for high-power lighting business—for the half-watt lamp has come as the saviour of the electrical position in this regard. High-pressure gas lighting, some of the electrical people believe, will simply sink into oblivion—that is, with high-pressure gas supplied at ordinary gas rates. We cannot give all the expressions of opinion gleaned by "Electrical Engineering," but a little bunch of the more scintillating gems will do. Mr. R. B. Leach, of Heywood, believes the half-watt lamp will "make gas competition for lighting purposes more a thing of the past." Mr. R. L. Acland, of Chesterfield, inclines to the view that the large units will be of great assistance in street ligeting; and as the lamp gets down to the lower candle units, the "Electricity *v.* Gas" question will be finally solved. Mr. A. J. Howard, of Taunton, is of opinion that the new lamp will enable competition with high-pressure gas to be conducted on "more than equal terms." Mr. J. G. Thain, of Stratford-on-Avon, looks upon the new lamp as "the counter-stroke to the high-pressure gas system." Mr. D. W. Dixon, of Merthyr Tydfil, welcomes the lamp "as a good reply to the recent keen competition of gas." A fearful thought is penned by Mr. H. Ranson, of Falkirk, who believes the "half-watt lamp will prove the last nail in the coffin of gas lighting." There are other electricians more modest in their views. *E.g.*—Mr. E. S. Rayner, of Doncaster, regards the new lamp as the "one thing needed to compete with the outside gas lighting of shops." Mr. G. H. Jackson, of Northampton, thinks the lamps will be very serviceable both to compete with high-pressure gas, and probably to replace arc lamps. Mr. F. M. Long, of Norwich, opines that the lamp will be of benefit in competition with gas. Mr. G. Porter, of Worthing, encourages the idea that the lamp will enable electricity undertakings to compete at least on equal terms with the high and low pressure high-power gas units, and to offer contract terms to local authorities based on figures that are not of necessity severely cut. Mr. W. Farrer, of Twickenham and Teddington, hopes by the aid of the lamp to "pull off" a contract for lighting a factory in competition with high-pressure gas. Mr. W. Christie, of certain eastern counties sea-coast towns, is under the impression that the new lamp will compare favourably with the cost of high-pressure gas.

Pretence or Firm Belief?

Has the Competition Position Changed?

Electrical engineers would show more discretion if they would seriously consider all the conditions as to costs, &c., before indulging in so much brag and in foreboding dire results for the high-power lighting of the gas industry. It is now freely acknowledged that the competition from their side with high-pressure gas lighting has been carried on, using arc lamps, at severely cut prices; and under the circumstances of the new lamps, it is plain that the electricity supply industry will with it lose money by continuing on the same lines. We treated of the new competition in an editorial article on Jan. 20; and it is evident that the flame arc lamp makers size-up their half-watt rival in much the same manner as we have done. The position, however, is a really perilous one for the arc lamp makers; for people have got tired of the expenses attaching to flame arc lamps, and of their irritating flickering and eye-distressing glare. Novelty can no longer sustain their patronage; and utility is a greater factor in the competition to-day, which is the reason why high-pressure gas lighting has had such an immense success in the competition—a success marked by solid revenue-producing business, and not by ingenious calculations on paper by ingenious electrical photometrists or central station engineers. The former is worth more than the latter as a mark of success. But the flame arc lamp makers may be trusted to do their part in letting light upon the flood of specious and favourable contentions upon which the new lamp is being floated. The arc lamp makers have their own interests to protect; and they will do their best. They indirectly, as we have already done directly, show that the position has not altered for high-pressure gas lighting; for, as a matter of fact, the new lamp has only supplemented the ranks of the electric high-power competitors. The Union Electric Company are the makers of the "Excello" flame arc lamp. They admit

in their advertisements, that the half-watt lamp is a great advance in electric incandescent lighting, but in nothing else. The flame arc lamps, they assert, have an efficiency of 5 to 6 candles per watt. Current costs, however, are not the whole thing in lighting. The arc lamp wants carbons and trimming and cleaning. The wire lamp also requires cleaning; and it also needs replacing, not only on account of filament breakage, but because its candle power is a gradually declining quantity. From the makers' statements one gathers that, at the end of about 800 hours, a half-watt lamp will have lost 20 per cent. of its candle power, and—if it has not broken before this time—it must then be replaced.

Flame Arc Makers' Comparison.

The Union Electric Company follow on with a comparison of costs, which, we fear, will not do them much good, as electrical engineers seem only too glad to get rid at any cost of flame arc lamps, judging from the testimonials to the worry with them that have appeared in "Electrical Engineering." However, this is the flame arc lamp makers' reckoning: Take a 1000 watt half-watt lamp, rated at 2000-candle power. This is measured without enclosing the lamp in the fitting in which it is used. The actual initial candle power emitted through the outer globe is about 1800; and after 800 hours, it will have dropped a further 20 per cent. The average effective candle power therefore will be about 1620. A lantern is also necessary; and about 28s. net should cover this. On the other side, take the "Excello." The nearest size would be that giving 2200-candle power with its globe on, and consuming 400 watts. Making up the balance-sheet of running costs, and taking net prices as quoted by the makers, we have the following:

Running Costs for 800 Hours.

Half-Watt Lamp.				"Excello" Flame Lamp.			
Average M.L.H.C.P. 1620				Constant (?) M.L.H.C.P. 2200			
Watts 1000				Watts 400			
One replacement lamp, 50s., less 20 per cent. .	£2	0	0	Carbons	£0	17	2
Interest on capital (lantern) at 5 per cent. . .	0	1	5	Trimming 50 times at 8d. per hour. . . .	0	4	0
Depreciation at 10 per cent.	0	2	9	Interest on capital (one "Excello" at £6), at 5 per cent.	0	6	0
Cleaning (38 cleans at 8d. per hour	0	1	0	Depreciation at 10 per cent.	0	12	0
	£2	5	2	Globe replacement . .	0	4	0
					£2	3	2
Units over 800 hours $\frac{1000 \text{ watts} \times 800}{1000} = 800$, at 2½d. unit	8	6	8	Units over 800 hours $\frac{400 \text{ watts} \times 800}{1000} = 320$, at 2½ per unit . . .	3	6	8
Total maintenance .	£10	11	10	Total maintenance . .	£5	9	10
Cost per lamp hour = 3·18d. Cost per candle power hour 0·00196d.				Cost per lamp hour = 1·64d. Cost per candle power hour 0·00075d.			

Exultingly the Union Electric Company wind up with the statement that the upkeep—current, replacements, &c.—of the half-watt lamp costs over two-and-a-half times that of the "Excello." Yet high-pressure gas-lamps have beaten flame arc lamps in open competition, with confessedly severely cut prices on the side of the flame arc lamps. It will be quite understood that the foregoing computations are those of a firm making flame arc lamps, and not our own; and, though they have appeared in the shape of a paid-for advertisement in one or more electrical contemporaries, we reproduce them here freely and completely, without any charge whatever.

A Candid Confession.

The Oliver Arc Lamp Company have also written to more than one of our electrical contemporaries to point out the absurdity (in their view) of those who entertain the opinion that the half-watt lamp is going to make the flame arc lamp a "back number." Incidentally they refer to the belief, too, that the new lamp is going to sweep high-pressure gas-lamps out of the field. Experience allows the Oliver lamp people to entertain no such deceptive idea. In one letter, they say: "Many seem to regard the new lamp as a new weapon to fight the high-pressure gas; candidly, from our own experience in severe competition with gas in street lighting, we consider it will require a lamp having a higher efficiency than one of half a watt per candle to defeat the enemy in these cases; and there is no lamp we know of, other than the modern magazine flame arc lamp, that has a sufficient margin in hand to ensure a successful competition." We will not comment on the final point in view of the previous handsome acknowledgment.

Slow Progress.

When an electric cooking outfit is installed, if it has a capacity for anything larger than a domestic joint, a hilarious whoop goes up among our electrical friends; but the "Electrician" continues to deplore the small advance that the domestic load statistically shows. The same state of affairs in regard to heating and cooking seems to exist in Germany, according to the latest available statistics. These refer to the last two years. The cooking and heating load is stated to total 82,842 kilowatts; the increase between 1911 and 1913 having been only 13·3 per cent.; whereas it was 94 per cent. in the biennial period preceding. The actual volume increases were 9722 kilowatts between 1911 and 1913, and 35,400 kilowatts between 1909 and 1911. This shows how small was the base on which the 94 per cent. increase was obtained.

The Competitive Price.

This slow progress in the heating and cooking business is due not only to the price of electrical energy, but to want of efficiency and to the cost of installation and upkeep. But Mr. A. H. Seabrook, of Marylebone, believes that price is an important factor in the business. He has been talking to the Point-Fives Association on the subject, and has been speaking pretty straight as to observing the fundamental law of business, which is that the selling price of a commodity is what it will fetch in the open market. He has also spoken strongly in defence of differential prices—pointing to the railway companies as examples of what is done in this regard to obtain an increase of passenger traffic, by means of season tickets at tempting prices, concessions for half-day tickets, low excursion rates, and so forth. Where the standing charges are not increased by the additional business, he sees no harm in allowing them to remain piled upon one section of the patrons—in the case of electricity supply, upon the lighting consumers. Mr. Seabrook has lately become a convert to the rateable value system, and he now believes that it is superior to all other bases of primary charge, with the proviso that, when the price of gas is not more than 2s. 6d. per 1000 cubic feet, the secondary rate should not exceed ½d. per unit. We need not endorse all that Mr. Seabrook says; but the following views are sufficient to show that, in the opinion of this progressive electrical chief, electricity has a tough task before it with gas in its way in the heating and cooking business. Among his remarks were these:

> It [the rateable value system] is adaptable to an almost universal application, because, although all undertakings cannot afford to take such a low percentage of rateable value as 10 per cent. per annum, they can take 20 or 25 per cent. without affecting the principle; and a very large number can then afford to supply the energy used at ½d. per unit (assuming gas competition at 2s. 6d.). . . . Where the price of gas is 2s. 6d. per 1000 cubic feet, there is no necessity to supply electricity for residence lighting at a lower rate than 6d. per unit (assuming a 2½ hours' use per day per annum). So far as competition is concerned, the business can be obtained at that figure. . . . But there are services electrical energy can be put to in the house—viz., heating and cooking—that cannot compete with 2s. 6d. gas at a much higher rate than ½d. per unit. Calculated as additional business only slightly increasing the existing investments cost and standing charges, the ½d. cooking and heating units can only be sold by those undertakings where the total additional cost of supplying them is something under ½d. But the profit from this class of supply may be much smaller than that from lighting. In fact, it is sound business to sell the extra units at ½d., even if the additional cost is at first over ½d., provided that there is reasonable prospect that, when the sales are considerably increased, the increased turnover so reduces costs that the ½d. becomes a profitable figure. Incidentally, such reduction in cost also increases the profit on the higher-priced business. . . . If we are unable to make up our minds to charge ½d. per unit, when that figure is the competitive market price for electricity used for cooking and heating, it is far better to fix (say) 3d. and keep off the business until we are really prepared to regard it as a serious item of income.

In the course of the discussion on the paper, the "Electrical Times" states that it was objected that 6d. per unit for electricity for lighting was not a competitive price with gas at 2s. 6d. per 1000 cubic feet. To this, Mr. Seabrook replied that he had in his area hundreds of large and small consumers paying 6d. per unit on the alternative flat-rates, and that it was quite possible to get even 8d. However, in spite of this, during the past year or so no consumer was charged more than an average of 6d., whatever his rate worked out at on either the telephone system or the Wright maximum demand system. It was further argued that electricity for cooking at 1d. per unit could compete with gas at 2s. 6d. per 1000 cubic feet. Mr. Seabrook was emphatic on the point that this was not so according to his experience, which amounted to 250 complete cooking outfits (single and multiple) using 1,000,000 units per annum. It is perfectly true that, as with heating also, 1d. or even 1½d. will bring in a certain amount of business—a residence here and there; but these are not competitive rates, because they will not show the consumer a sufficient advantage over gas and coal to induce him to really make an everyday use of electricity.

Water Tightness in Reservoir Construction.—This subject has been under discussion in the "Sanitary Record and Municipal Engineering;" and the current number of it contains a letter by Mr. Percy Griffith, M.Inst.C.E., the Secretary of the Institution of Water Engineers. The writer says that for covered reservoirs he has almost invariably used portland cement rendering as the waterproof material, with either brickwork or ordinary or the reinforced concrete in the walls and floor. The rendering should, he points out, be of equal parts of sharp sand and good cement in good condition. It should be laid on the face of the walls and floor in a layer from ¾ inch to 1 inch thick; the face being roughly trowelled. The face is then washed over with fine neat cement slurry, and this is worked in with a metal trowel; neat dry cement being dusted over the surface from a coarse bag, and the trowelling being continued until the face acquires a polish almost bright enough to reflect like a looking-glass.

GAS LEGISLATION FOR 1914.

[Fifth Article.]

Having disposed of the Gas Bills that have been deposited, we turn to the Provisional Orders, taking first those that have been lodged with the Board of Trade.

An unusual one is the first Order. It is entitled "Balcombe Petrol Gas," and is promoted by a Company to empower them to manufacture, store, and supply petrol gas. A share capital is proposed of £4500, consisting of ordinary share capital of £3500 (called the original capital), and additional capital not exceeding £1000. The dividend is limited to 10 per cent. in respect of the original capital, and 7 per cent. on the additional capital, or 6 per cent. on the part of the latter issued as preference. The borrowing powers are on the ordinary one-third lines. It is proposed to provide that the gas shall be supplied at such a pressure as to balance a column of water of not less than 3 inches in height at the main, or as near as may be to the junction therewith of the service-pipe supplying the consumer. The quality of the gas to be supplied it is intended shall be such as to produce at the testing-place—using a suitable burner for the time being approved by the Board of Trade, and consuming 5 cubic feet per hour—a light equal in intensity to the light produced by 35 sperm candles. The proposal as to a maximum price for the gas is as follows: In any year during which the total amount of gas supplied does not exceed a million cubic feet, 5s. per 1000 cubic feet; in any year in which the amount exceeds 1 million but does not exceed 2 million cubic feet, 4s. 6d. per 1000 cubic feet; and in any year during which the total amount exceeds 2 million cubic feet, 4s. 3d. per 1000 cubic feet. At any time after the expiration of five years from the commencement of the Order, it is proposed there shall be a right of appeal to the Board of Trade in regard to the revision of the price. A stand-by clause and many other ordinary provisions applicable to general gas supply are included in the Order. [*Parliamentary Agents: Messrs. Church, Adams, and Prior.*]

What will be known as the Calvert (Charndon) Gas Order falls next for notice; and this refers to a natural gas supply. The limits of the supply area comprise defined parts of Twyford and Charndon in the county of Buckingham. The City Oil Syndicate, Limited, are the promoters of the Order; but it is stipulated that the powers to be conferred by it shall not be exercised unless and until a company shall have been formed and duly constituted for the purpose of carrying on the undertaking. The transfer, too, is not to have any validity or effect until after the approval of the Board of Trade. A capital of £15,000 is contemplated, with borrowing powers equal to one-third part of the issued capital. The promoters ask for power to purchase land by agreement for the purpose of boring for, and producing natural gas, and to erect and maintain upon such lands the necessary works. The maximum price proposed for the gas is 3s. 6d. per 1000 cubic feet. When the gas is supplied for power purposes, it is desired that the provisions of the Order as to illuminating power, pressure, or purity shall not apply. For ordinary purposes, a standard illuminating power, tested by the "Metropolitan" No. 2 burner, of 14 candles is suggested. There is a protecting provision to the effect that, so long as the undertakers are exercising the powers conferred upon them by the Order, no other corporation, company, or person shall bore for, collect, produce, or distribute natural gas in or upon any lands within the limits of supply for the purposes of the sale of such natural gas, or its utilization for power. [*Parliamentary Agent: Mr. Mark Attenborough.*]

The Dronfield Gas Company ask for their borrowing powers to be enlarged from £6000 to £8000. They also desire power to purchase additional lands and to construct further works. Among miscellaneous clauses is a stand-by relating to both gas and electricity. [*Parliamentary Agents: Messrs. Lees and Co.*]

The Dursley Gas Company, Limited, require more share capital; and they seek authority to raise £18,000, provided that the total share capital does not exceed £25,000 until further authorization is secured. The part of the additional capital issued as ordinary, it is proposed, shall be entitled to a dividend of 7 per cent., and the part issued as preference to 5 per cent. The right to borrow the equivalent of one-third of the issued capital is sought. Works and trading powers are also included. [*Parliamentary Agents: Messrs. Dyson and Co.*]

The East Kent Order proposes a new Company for the supply of gas to certain parishes in the rural districts of Elham, Eastry, Bridge, and Dover in the eastern division of the county of Kent. The promoters are Mr. John F. Kelley, of Sutton, and Mr. C. B. Tully, of Hythe; but the powers conferred by the Order are not to be exercised until a company (approved by the Board of Trade) has been formed. The proposal as to capital is £200,000, with the right to borrow the equivalent of one-third part of the issued capital. Lands and works clauses appear; and then follow clauses protecting the local railway companies, the Kent County Council, and the various rural district councils. The promoters propose a calorific value standard and test on the lines of the South Suburban model, as referred to in former articles reviewing the Bills for the coming session. The standard price proposed is 5s., with the sliding-scale operating half-yearly on the lines of 1s. 6d. variations of dividend in respect of penny changes in price. The other clauses are customary ones. [*Parliamentary Agents: Messrs. W. & W. M. Bell.*]

The Garstang Gas Company, Limited, wish to extend their limits of supply, to raise further capital, and to be invested with other powers. The extension of area proposed is to the township of Claughton. Further share capital to the amount of £3000 is sought, providing that the share capital shall not exceed in the whole £6500. The dividends proposed are not to exceed 7 per cent. on the ordinary capital and 6 per cent. on such part as is issued as preference. It is desired to have the right to borrow up to one-third part of the issued capital. The standard illuminating power of the gas is to be 14 candles. [*Parliamentary Agents: Messrs. Sharpe, Pritchard, and Co.*]

The Harpenden District Gas Company are contemplating a broadening of their base. They want their area of supply extended so as to include the part of the parish of Wheathampstead not already embraced in their district. An additional capital authority not exceeding £25,000 is sought, with one-third borrowing powers on the issued capital. On the part of the additional capital issued as ordinary, a dividend of 6 per cent. is suggested; and on that issued as preference, 5 per cent. A common stipulation now is that the carry-forward shall not exceed the amount required for a year's dividend. The Company suggest that this shall apply to them, but not until after Dec. 31, 1918. It is further provided that the price to be charged for gas in the extended area shall not exceed that for the time being charged within the limits of supply as defined by the Company's Act of 1901. The standard quality of gas is proposed at 14 candles. Among the miscellaneous clauses is a stand-by one relating to both gas and electricity. [*Parliamentary Agents: Messrs. Reynolds and Miles.*]

The Hayfield Gas Company, Limited, require additional lands, works, and capital. The proposition as to further capital is £10,000 (carrying a dividend of 7 per cent.), provided that the total share capital does not exceed £15,000. Supplementing the sum already borrowed, the Company ask for the right to borrow up to one-third of the additional capital actually issued and paid up. Lands and works clauses succeed. It is suggested that section 10 ("Limit of Dividend on Capital") of the Order of 1909 shall be read as if the words "unless a larger dividend be at any time necessary to make up the deficiency of any previous dividend which shall have fallen short of the said yearly rates" had been added at the end of the section. [*Parliamentary Agents: Messrs. W. & W. M. Bell.*]

An Order of very few clauses is being promoted by the North Middlesex Gas Company; the main objects being to secure powers to construct works upon certain scheduled lands, and to apply any capital raised under, or authorized by, their Acts to any of the purposes of the present Order. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

The St. Ives (Hunts) Gas Company, Limited, propose an extension of their limits to various parishes in the counties of Huntingdon and Cambridge. In the added areas, they ask for the right to charge prices not exceeding the following: In Wyton, Houghton, Holywell-with-Needingworth, and Fen Drayton, 5s. 3d.; in Bluntisham-with-Earith, Colne, and Swavesey, 5s. 6d.; in Over, 5s. 8d.; in Somersham and Willingham, 5s. 10d.; and in Warboys and Pidley-cum-Fenton, 6s. The prices charged in the existing limits are alone to be taken in determining the dividends to be paid. The Company desire power to purchase lands in the parishes of Fen Stanton and Somersham, and to be invested with works powers in relation thereto. Further share capital authorization to the amount of £12,500 is sought, conditional upon the total share capital issued not exceeding £30,000. The portion of the additional capital issued as ordinary it is proposed shall be entitled to a dividend not exceeding 7 per cent., and the part issued as preference to 5 per cent. As to borrowing powers, the Company wish to be empowered to raise a further sum not exceeding £1250 in respect of the capital authorized by their Orders of 1889 and 1903, and one-third part on the issued new capital. Regarding the quality of gas, the Company desire to have the standard prescribed as 14 candles. A stand-by clause relating to gas and electricity is included. [*Parliamentary Agents: Messrs. Rees and Freres.*]

The Swansea Gas Company are seeking, by Provisional Order, a new works site, containing 25 acres 2 roods and 30 poles (belonging to the Duke of Beaufort) in the parish of Llansamlet; and they desire the repeal of their Order of 1912. [*Parliamentary Agents: Messrs. R. W. Cooper and Sons.*]

The Uxbridge Gas Company require additional capital, and ask power to the raising of £100,000, with one-third borrowing powers. All the other clauses (including the stand-by one) are quite usual in character. [*Parliamentary Agents: Messrs. Lees and Co.*]

There are only two applications to the Local Government Board in which we are interested from the gas-supply point of view.

The first is the Bourne District Council Order. Subject to the sanction of the Board, the Council have agreed to buy the property of the Bourne Gas and Coke Company, Limited; and the present Order is to confer all the necessary powers of purchase and for carrying on the business. In this connection, we should like to see the works clause expanded, so as to have the words "purchase" and "deal in" incorporated among those conferring the right to "manufacture, convert, or prepare, store, and sell any residual products." The standard illuminating power of the gas is placed at 14 candles; and the maximum price of the gas, it is

proposed, shall not exceed 5s. 6d. per 1000 cubic feet. For public lighting, the price is not to be less than that charged to private consumers by more than 10 per cent. The Council ask for power to demand prepayment (when they deem it necessary so to do) for gas required to be supplied for six months or any shorter period; and in such cases they may refuse to supply gas unless the estimated cost thereof (for such period as the Council may fix) be prepaid, and, at the end of such period, the Council shall be paid, or shall repay, any deficiency or excess of money actually payable for gas so supplied. This is additional to the ordinary prepayment meter clauses. In addition to the sum needed for the purchase of the works, the Council desire authorization to borrow such sums for the purposes of the undertaking as may be desirable under the sanction of the Local Government Board. The application of revenue follows the usual lines; but no balance is to be carried to the credit of the district fund so long as the price of gas exceeds 4s. 6d. It is also proposed that "the Council shall not defray any of the charges and expenses of carrying this Order into execution other than payments required to be made in respect of money borrowed on mortgage of the district fund and general district rate out of that fund or rate when the price of gas to private consumers is less than 5s. 6d. per 1000 cubic feet." [*Parliamentary Agents: Messrs. Sherwood and Co.*]

The Wokingham Corporation are desirous of extending their gas-works, purchasing additional lands, and borrowing more money for the purposes of their undertaking. The necessary land is described in a schedule to the Order; and the clauses are intended to give the requisite authorization for its utilization. In respect of borrowing powers, the purposes of the Order, it is suggested, shall be deemed to be the purposes of the Wokingham Order of 1894 within the meaning of Article XV. of that Order. The Corporation now wish the standard quality of gas to be defined as of 14 candles. The remaining clauses are of ordinary form; and they include a stand-by one referring to other gas supplies, but not to electricity. [*Parliamentary Agents: Messrs. Sharpe, Pritchard, and Co.*]

A few Orders, containing sections referring to gas matters, have been deposited in the Scottish Office.

In the Aberdeen Corporation Order, there is a clause dealing with the valuation of underground gas and water pipes and electric lines. It reads: "The yearly value of all underground gas and water pipes, electric mains and lines, and underground works connected therewith belonging to the Corporation, and laid outside the city shall, for the purposes of all assessments leviable on occupiers under the Local Government (Scotland) Acts, 1889 to 1908, be deemed to be one-fourth of the yearly value thereof as entered in the valuation roll."

In the Dundee Extension and Gas Bill, provision is made for the application of more land to gas manufacturing and storage works, and all the operations arising therefrom, including the manufacture of residuals, in respect of dealings in which the fullest powers are properly proposed to be taken. Authorization is desired to the borrowing of such money as may be necessary. [*Parliamentary Agents: Messrs. Wm. Robertson and Co.*]

The Glasgow Corporation are looking forward. There is a lighting section in an Order they are promoting, which section is to come into operation on and after the term of Whit Sunday, 1922. It proposes the repeal of the following provisions of the Act of 1866: Section 359 (Proprietors to Pay Expense of Lighting Private Streets and Courts); section 361 (Lighting of Common Stairs); and section 362 (Proportion Payable by Proprietors). Fresh provisions (incorporated in this Order) are then to apply. It is first provided that, notwithstanding the repeal of section 359, the Forth and Clyde Navigation are to light the harbours, quays, wharves, and streets owned by them in a suitable manner to the satisfaction of the inspector of lighting; and in respect to the cost thereof the Company are to be entitled to a deduction from the annual assessment to be levied on them, under this Order, of a sum equal to 2d. per pound on one-fourth of the amount entered as the yearly rent or value of the harbours, quays, wharves, and streets as appearing in the valuation roll. The next clauses provide for the proprietors of land or heritage having an access by a common stair to provide and maintain suitable pipes and (or) wires in proper condition for use for lighting them; and the Corporation, on their part, undertake to provide, fit up, maintain, and renew brackets, lamps, and fittings, and other means of lighting, and all necessary means of extinguishing, as well as light the stairs in a suitable manner during the same hours as the public streets are lighted. Where proprietors do not fulfil their part of the work, the Corporation may cause it to be done, and recover the cost as a debt. For defraying the expenditure for, and in connection with, the lighting of the city yearly from Whit Sunday, 1922, the Corporation propose to take power to assess and levy upon and from the owners and occupiers of all lands and heritages situated within the city in the proportion of one-half upon and from the owners and the remaining one-half upon and from the occupiers of such lands and heritages, an annual assessment not exceeding 6d. per pound of the yearly rent or value of such lands and heritages, as appearing in the valuation roll. [*Parliamentary Agents: Messrs. Martin and Co.*]

The Kirkcaldy Corporation, in an Order dealing with several matters, desire that the bounds of their gas-supply area shall be more strictly defined. They propose that the limits shall be the burgh and the portion of the parish of Kirkcaldy and Dysart beyond the same, as well as the parishes of Kinghorn, Auchtertool, Kinglassie, and Markinch. There is a provision that the Corporation shall not supply gas within a described part of the parish of Kirkcaldy and Dysart without first obtaining the consent of the Dysart Gaslight Company, Limited, and within a portion of the parish of Kinghorn without first obtaining the consent of the Kinghorn Gaslight Company, Limited. There is also a clause proposing to enact that nothing in the Order, or in the Acts, or parts of Acts, incorporated therewith, shall limit or interfere with the rights of any owner, lessee, or occupier of any mines or minerals outside of the burgh lying under or adjacent to any road along or across which any gas main or pipe shall be laid to work such mines or minerals. [*Parliamentary Agent: Mr. W. L. Macdinoe.*]

A Provisional Order comes from the county of Lanark under these circumstances: By the Burghs Gas Supply (Scotland) Act, 1876, the town council of a burgh are authorized to resolve that the Act be adopted, and thereupon the council are empowered to purchase and erect gas-works, and to manufacture and supply gas for public and private purposes, and to exercise other powers in relation to the supply of gas within the burgh and districts adjacent. The Act of 1876 was amended in certain respects by the Burghs Gas Supply (Scotland) Act, 1893. By the Local Government (Scotland) Act, 1894, section 44, it is enacted:

> Upon the formation of a special lighting district under the provisions of this section, it shall be lawful for the district committee to adopt the Burghs Gas Supply (Scotland) Act, 1876, and any Act amending the same; but in such case the provisions of the principal Act—that is, the Local Government (Scotland) Act, 1889—with respect to capital expenditure, borrowing, and audit of accounts shall apply in lieu of the corresponding provisions of the former Acts or of this section, and in the application of the former Acts the expression "burgh" shall be construed to mean special lighting district "commissioners," "town council" and "commissioners of police" to mean district committee, and "elector" and "ratepayer" to mean a person registered as a county elector the subject of whose qualification is situated within a special lighting district.

Numerous special lighting districts have been formed within the county, and other special districts may from time to time be created therein. It is now submitted that it is expedient that the powers of the Act of 1876 should be made available within those districts. Owing, however, to the differences which exist between the method of election of the town council of a burgh and of a district committee, and to the relative position and powers of a county council and a district committee, the difficulties arising from which are not effectively met by section 44 of the Act of 1894, it is in effect impossible, notwithstanding the last-mentioned section, to adopt and carry into effect the provisions of the Act of 1876 within a county area. Therefore, in order to enable the powers of the Act of 1876 to be adopted and exercised within the county, the Act of 1876, the preamble of the present Order says, should in relation to the county be amended. It may happen, too, that the boundaries of a special lighting district are not coterminous with the area within which a gas company whose undertaking is acquired under the powers of the Act of 1876 is in fact supplying gas; and therefore it may be expedient in the interest of the district that in such circumstances a district committee of the county should be enabled to exercise the powers of the Act of 1876 throughout the area supplied by the gas company. There follow nearly five pages of clauses to give effect to these various submissions. [*Parliamentary Agents: Messrs. Grahames, Currey, and Spens.*]

Central Suspension Gas Lighting.

A reference was recently made to the experiment in lighting by central suspension lamps which the Rochester, Chatham, and Gillingham Gas Company are undertaking in High Street, Rochester. The Kent Electric Power Company did something similar recently; and thereupon Mr. C. Valon Bennett, the Gas Company's Engineer, sent a letter to the Corporation, asking whether the Company might show the Council what could be done with gas. Permission was given, and there were installed four 1200-candle Sugg-Littleton lamps, each containing twelve small inverted incandescent burners. The lamps are hung on the improved suspension gear of the London Electric Firm, of Croydon, which embodies special features already decribed in our pages—the auto joint, capable of withstanding pressures up to 300 inches water-gauge, the patent self-sustaining winch, and the automatic weight-relieving arrangement. The span wires are fixed to the buildings on the side of the road sufficiently high to easily clear the tramway system; and the lamps traverse horizontally, and lower to the sidewalk for maintenance purposes. With this system irregular or old buildings prove no obstacle; the difficulty having been surmounted here, as well as at Bromley and other places, by fixing to chimney stacks, erecting dwarf poles on roofs, or even a long pole at the back of a low building, and also by carrying the wire through or over a roof and fixing at the back. The firm point out that, in connection with the Road Board's recent pronouncement in favour of central suspension lighting, and pending the settlement of the compulsory powers which are being sought to attach fixtures to frontagers' buildings, note may be made of the fact that existing tramway pillars may in many cases be utilized to carry the span wire for the support of the lamp.

NOTES FROM ABROAD.

Japanese Affairs.

According to the "Journal of the Imperial Gas Association of Japan," 16 new undertakings came into operation during the year 1913; but this has only increased the total in the whole country from 79 to 82. This fact is accounted for by the general tendency towards amalgamation which is now prevalent in the land. It is suggested that this movement may do something to advance the industry, which has not made the progress recently which was being made some years back. Unsuccessful management of provincial concerns is mentioned as one of the reasons, and amalgamation should ameliorate this. The "Journal" looks with satisfaction on the increasing price of petroleum, which, though losing ground in the lighting business, is increasing in use as fuel. Japan seems to be no exception to the rule of high coal prices, but the gas industry appears on the whole to have benefited by them, through the consequent increase in the use of gas-heating appliances. It is said that the Central Government has under consideration a set of state regulations for gas undertakings, which may shortly be enforced. At present there is only provincial regulation governing the industry in each prefecture, which the "Journal" considers is more desirable in the present state of development.

Bye-Products in Russia.

According to the "Chemical Trades Review," coke-oven bye-products in Russia are becoming an important consideration. During the first eight months of 1913 there were ten installations in the South recovering bye-products, which produced some 816,000 tons of coke, or more than 2½ times the production in the same period of 1912. The yield of tar was about 24,000 tons, and of ammoniacal liquor 11,000 tons. Some 8160 tons of sulphate of ammonia were produced last year, as against only 1740 tons the previous year. The mind of the Russian farmer does not move quickly; so that, if this remarkable increase continues, large quantities of sulphate from Russia will be thrown on the European market, as the production is already too large for native consumption.

Progress in Hungary.

The Budapest Municipal Gas-Works in the past year have fully justified the hopes formed of them. In 1913 they delivered altogether 83,290,000 cubic metres (about 2941 million cubic feet) —an increase of 5·5 per cent. on the previous year. In the last three years they can show the remarkable increase of 30·02 per cent., and the consumption has more than doubled itself in ten years. The highest output for one day last year was 373,000 cubic metres (about 13,574,000 cubic feet). The best monthly increase was 12·3 per cent., in July.

Atmospheric Nitrogen.

News of activity in the atmospheric nitrogen industry comes from many parts of the world. According to Reuter's correspondent at St. John's, Newfoundland, the Colonial Government has granted a concession for the use of one million H.P. water-power at the Grand Falls, Labrador, with which it is intended to generate electricity for the extraction of nitrogen from the atmosphere. Proposals have been made to start a lime-nitrogen fertilizing industry in the Himalaya Mountains, and particularly in Kashmir, where water power is already developed, and lime deposits abundant. The Société Norvégienne de l'Azote is still expanding, and it is expected that the output of nitrate of lime in 1915 will reach 160,000 tons. The Société has also granted licences for Spain, and works of 25,000 H.P. are being constructed at Lerida.

A High Calorific Standard.

The gas companies of New Hampshire, U.S.A., seem to be kept up to the scratch with regard to the gas they supply. The Public Service Commission of the State has decided that the companies must submit their gas to periodic official testings for purity, heating value, and pressure, and any other regulations prescribed from time to time. The average heating value is to be 600 B.Th.U. per cubic foot, with an absolute minimum of 550. The companies have further been ordered to instal calorimetric outfits, and make tests of their gas three times weekly, the records of which are to be always open to public inspection.

Coke-Oven Gas near Berlin.

The community of Lichtenberg—a suburb of Berlin—has settled on the erection of a complete coke-oven plant. The gas, being looked upon as a bye-product, will be sold at exceptionally low prices. The contract, which includes necessary condensing and purifying plant, and a 250,000 cubic feet holder, requires that everything shall be ready for working by June this year.

Gas Consumption per Head of Population.

A remark made recently on this subject in the "Journal de l'Eclairage au Gaz" has elicited from a correspondent the opinion that Brussels can show the highest consumption per head of population. He states that the commune of Brussels proper, supplied from the municipal gas-works, has only 178,000 inhabitants. The gas consumed in 1912, exclusive of leakage and gas-works requirements, but including public lighting, was 44,336,450 cubic metres [1,565,963,000 cubic feet] and that sold 40,573,788 cubic metres [1,433,066,000 cubic feet]. This makes 249 and 228 cubic metres [9330 and 8050 cubic feet] per head respectively, which, the author states, are a little higher than the figures given for London. In the lecture he delivered before the Institute of Chemistry in December, 1912, Mr. W. J. A. Butterfield claimed the first place for London, with 8000 cubic feet consumed per head.

Gas for Bakers' Ovens.

It may be remembered that a paper was read on this subject by M. Rouland at the French Association meeting last summer, which described this field for gas as very promising. The Minneapolis Gaslight Company now announces through its publication, the "Minneapolis Gas Journal," a bread-baking competition. Each competitor may submit one loaf only, which must have been baked in a gas-oven. The three best makers are each to be presented with a cabinet gas range.

German Gas Consumption.

The Zentrale für Gasverwertung—the German Gas Publicity Centre—publishes the results of its inquiries on gas consumption for the year 1912-13. The 690 works which it is able to compare with the previous year showed a consumption of 1,944,904,000 cubic metres [about 68,694 million cubic feet], which is an increase for these works of 6·7 per cent. over the year 1911-12.

Gas Helps Electricity.

The "Gas Record" tells us that, at the carbon lamp division of the General Electric Company at Cleveland, more than 1½ million cubic feet of gas are used every month in the manufacture of carbon filament lamps. It is devoted to many purposes in all divisions of the factory, but is chiefly used through small torches for the delicate heating and fusing of glass-work. These torches, together with a small oven used for annealing the glass after blowing, consume an average of 30 cubic feet of gas per hour. In the paper read by Mr. H. M. Thornton before the B.C.G.A. last October will be found other applications of gas in the electrical industry.

A Warning.

As a warning to gas-meter inspectors may be mentioned a suit for damages brought against the Citizens' Gas and Fuel Company, of Terre Haute, Ind., in which a woman claimed $10,000. The inspector, having read the meter in a cellar, failed to close the door on leaving, and the owner of the house, approaching it in the dark, and imagining it to be closed, fell down the stairs and sustained serious injuries. A similar case was mentioned recently in the "JOURNAL," when an accident was caused through a chair left outside a door by a collector, and £15 damages were awarded.

Removal of Carbon Bisulphide from Gas.

According to a footnote to a communication by M. Grebel to the "Journal de l'Eclairage au Gaz," M. Oscar Guillet has lately patented a process for removing bisulphide of carbon from gas. It consists in passing the gas, while still charged with moisture, into an oxide of iron purifier, heated to a temperature of between 80° and 200° C. (176° and 392° Fahr.). The carbon bisulphide, on coming into contact with the aqueous vapour, gives off carbonic acid and sulphuretted hydrogen, which are arrested by the oxide of iron. It is stated that at the ordinary working temperatures the constituents of the gas are not affected.

Gas Mixer and Economizer.

In a recent number of the "Zeitschrift für Angewandte Chemie" [No. 13, for 1913], attention was called to a method of mixing gas and air in certain proportions, whereby economy in consumption is ensured. The mixing apparatus, consisting of a small rotary compressor worked by an electric or a hydraulic motor or belt gear, is connected with the main. It mixes 1½ parts of air and 1 part of gas, and sends the mixture into the burner pipes at a regular pressure. The orifice of the burner has to be enlarged to correspond with the greater delivery. The mixture produces a short but very hot flame. The appliance is made to deal with consumptions ranging from 250 to 1750 cubic feet per hour; and the motive force required ranges from 0·25 to 1 H.P. With hydraulic motors, a pressure of two atmospheres is found to be sufficient.

Concrete-Hardening Material.

A material for hardening concrete now being introduced in the United States contains 95 per cent. of iron dust, which is mixed with cement for finishing the surface of concrete floors. From 15 to 25 lbs. of the material are mixed with 100 lbs. of the cement while dry, and one part of this mixture to two parts of sand makes the slurry for the top coat, which varies from 0·5 to 1 inch in thickness. It is said to make a hard and durable floor, which is waterproof and not slippery. The hardening material is used also to make new concrete adhere to old in repair work.

Photography by Incandescent Gas.

In Vienna, according to a paragraph in the "Ironmonger," incandescent gas-lamps are being largely employed for photographic purposes, and in one studio, which is fitted with nine Graetzin burners, exposures take from three to four seconds. According to Pictet, the incandescent light obtained with gas and oxygen is especially suitable for photographic purposes, as it is spectroscopically very similar to sunlight.

THE GASLIGHT AND COKE COMPANY.

The Past Half-Year's Accounts.

In the last number of the "JOURNAL" we gave the report of the Directors of the Gaslight and Coke Company for the six months ended the 31st of December last. It was accompanied by the accounts for this period, consisting of the usual statements, which furnished the following particulars.

The statement of capital (stock) sets forth that the total paid-up is £10,413,480; added on conversion, £12,832,955—total amount authorized, £23,246,435. Deducting the amount redeemed, £197,540, the total amount of the Company's existing capital powers is £23,048,895. The statement of loan capital stands thus: Total paid up, £3,186,660; added on conversion, £1,618,190; unissued, £750,000—total amount authorized, £5,554,850.

The capital account shows receipts (with premiums, £1,688,957 14s. 8d.) to the amount of £29,542,702 14s. 8d. The expenditure is shown in the following items:—

Expenditure to June 30, 1913			£14,909,991 14 3
Expenditure during the half year to Dec. 31, 1913—viz.,			
Buildings and machinery in extension of works	£4,370 11 10		
New and additional mains and service-pipes	13,718 16 7		
Do. do. meters	20,081 17 1		
Do. do. stoves	49,362 10 0		
		87,533 15 6	
			£14,997,525 9 9
By sale of surplus land	£5,618 8 7		
By depreciation of plant	1,461 11 2		
By depreciation of meters and stoves	60,007 19 3		
		67,087 19 0	
Total expenditure			£14,930,437 10 9
Nominal amount added on conversion			14,451,145 0 0
			£29,381,582 10 9
Deduct amount of capital redeemed under Company's Act of 1903			197,540 0 0
			£29,184,042 10 9
Balance of capital account			358,660 3 11
			£29,542,702 14 8

The total of the net revenue account is £1,233,262, compared with £1,350,207 at Dec. 31, 1912. The balance applicable to the redemption fund and to dividend on the ordinary stock is £1,027,794 17s. 7d.; and the following statement shows how it is proposed to appropriate it:—

Dec., 1912.			
£768,408	..	Net balance brought from last account	£710,551 15 8
358,431	..	Net revenue for the half year	317,243 1 11
£1,126,839			£1,027,794 17 7
15,000	..	Contribution to redemption fund	15,000 0 0
(£4 17s. 4d. p. ct.)		Dividend on the ordinary stock—	
£399,452	..	£4 17s. 4d. per cent. per annum on £16,386,660	398,742 1 2
£712,387	..	Balance carried to next account	£614,052 16 5

The three statements relating to the reserve, special purposes, and depreciation funds stood as follows on Dec. 31: Reserve fund, £71,285; special purposes fund, £293,622; depreciation fund, £85,691.

The following statements relate to the working:—

Statement of Coal, &c., Used.

Description of Coal.	In Store June 30, 1913.	Received During Half Year.	Carbonized During Half Year.	Used During Half Year.	In Store Dec. 31, 1913.
	Tons.	Tons.	Tons.	Tons.	Tons.
Common	152,944	1,053,741	948,984	1792	255,909
Cannel	5,730	4,208	155	..	9,783
Total	158,674	1,057,949	949,139*	1792	265,692

* In addition to this quantity of coal, 6,607,377 gallons of oil were used during the half year.

Statement of Residual Products.

Description.	In Store June 30, 1913.	Made During Half Year.	Used During Half Year.	Sold During Half Year.	In Store, Dec. 31, 1913.
Coke—tons	93,730	594,147	120,745	474,910	92,222
Breeze—tons	7,521	114,569	14,326	93,659	14,105
Tar, from coal only—galls.	1,025,206	9,712,724	8,834,271	542,174	1,361,485
Ammoniacal liquor—butts	34,989	306,921	316,294	..	25,616

Statement of Gas Made, Sold, &c.

Quantity Made.	Quantity Sold.		Total Quantity Accounted for.	Number of Public Lamps.
	Public Lights and Under Contracts (Estimated).	Private Lights (per Meter).		
Thousands.	Thousands.	Thousands.	Thousands.	
*14,525,698	470,353	12,887,400	13,532,525	45,645
†14,657,680	480,550	13,119,809	13,759,604	46,314

* Including 2,845,278,000 cubic feet of carburetted water gas. † Dec. half year, 1912.

The following is the revenue account:—

Expenditure.

December Half Year, 1912.		£ s. d.	£ s. d.
	Manufacture of gas—		
£733,209	Coal, including all expenses thereon	782,607 2 6	
37,429	Oil ,, less value of oil tar	46,375 11 6	
42,446	Coke and breeze used in the manufacture of carburetted water gas	42,744 3 1	
15,259	Salaries of Engineers and other officers at works	15,538 6 0	
118,319	Wages	102,809 17 8	
16,345	Purification	19,589 15 7	
255,443	Repair and maintenance of works and plant, materials and labour, less received for old materials, £6053 19s. 10d.	259,881 17 1	
	Distribution of gas—		1,269,546 13 5
59,748	Salaries and wages of officers (including rental clerks)	60,666 7 1	
106,322	Repair and maintenance of mains and service-pipes, &c.	100,294 15 8	
84,414	Repair and renewal of meters	80,453 16 9	
1.6,611	,, ,, stoves	105,989 6 5	
31,182	Gas fittings, including labour (automatic meter supplies)	21,547 11 10	
			368,951 17 7
28,966	Public lamps—lighting and repairing	..	27,680 1 9
	Rents, rates, and taxes—		
7,104	Rents payable	7,152 13 2	
161,850	Rates and taxes	153,953 0 3	
			161,105 13 5
	Management—		
3,750	Directors' allowance	3,750 0 0	
319	Company's Auditors	300 0 0	
9,009	Salaries of General Manager, Secretary, Accountant, and clerks	9,276 2 10	
26,873	Collectors and cashiers	26,875 18 10	
6,340	Stationery and printing	5,177 1 5	
8,842	General charges	7,571 6 10	
			52,950 9 11
22,000	Co-partnership for the hal. year	..	23,000 0 0
132	Parliamentary charges	..	1,099 14 10
1,159	Law charges	..	1,358 9 0
6,812	Bad debts	..	6,151 3 0
500	Depreciation fund for works on leasehold lands	..	500 0 0
27,646	Annuities to officers and workmen, including contribution to officers' superannuation fund	..	28,295 1 5
2,169	Workmen's compensation account	..	2,785 3 9
3,828	Company's Contribution under National Insurance Act, 1911	..	4,521 8 7
	Public officers—		
859	Gas Referees and Official Auditor	750 10 11	
628	Public testing-stations	613 9 11	
			1,364 0 10
£1,925,513			1,949,309 17 6
580,477	Balance carried to net revenue account		522,710 5 2
£2,505,990			2,472,020 2 8

Revenue.

December Half Year, 1912.		£ s. d.	£ s. d.
	Sale of gas—		
£1,606,090	Per meter, at 2s. 6d., 2s. 9d., 3s., and 2s. 2d. per 1000 cubic feet	1,573,159 5 10	
65,741	Public lighting and under contracts	63,210 5 2	
			1,636,369 11 0
£1,671,831			
71,274	Rental of meters	..	73,225 3 8
64,467	Rental of stoves	..	70,038 14 1
94,030	Rental of fittings	..	95,081 0 1
	Residual products—		
£371,467	Coke, less £36,120 1s. 2d. for labour, &c.	362,309 6 5	
25,514	Breeze, less £11,497 15s. 8d. ,, ,,	26,500 16 5	
77,588	Tar and tar products	89,770 0 6	
124,119	Ammoniacal liquor and sulphate of ammonia	112,910 2 10	
			591,490 6 2
£598,688			
£5,370	Rents receivable		5,512 2 8
330	Transfer fees		303 5 0
£2,505,990			2,472,020 2 8

The remaining statement is the balance-sheet, which gives the value of the stores on hand at the close of the half year as follows: Coal, £223,956; gas oil, £32,934; coke, £55,293; tar and ammoniacal liquor and products, £137,728; and sundries, £294,918. The figures this time last year were: Coal, £137,223; gas oil, £6597; coke, £19,102; tar, ammoniacal liquor, and products, £152,610; sundries, £276,734.

SOUTH METROPOLITAN GAS COMPANY.

The Directors' Report and the Accounts.

THE following is the report of the Directors of this Company for the six months ended the 31st of December, which, with the accounts (an abstract of which appears below), will be presented to the proprietors at the half-yearly meeting to-morrow week.

The profit for the past half year being insufficient by £58,840 to pay the dividend authorized under the sliding-scale on the ordinary stock—viz., at the rate of £5 9s. 4d. per cent. per annum—it is necessary to meet the deficiency from the amount brought forward six months ago.

The abnormal cost of coal is the sole reason for this deficit, and is in great measure due to the unprecedented export to the Continent, which has had the effect of seriously handicapping many other British industries. A reimposition of the export tax on coal would have a counteracting influence upon this undue inflation of home prices.

Except as regards tar products, the prices realized from resi-

duals have been disappointing; production having been somewhat in excess of market requirements.

The gas sold has been 1·56 per cent. above an increase of 6·21 per cent. during the corresponding period of 1912. This increase cannot be regarded otherwise than as satisfactory evidence of the sustained popularity of gas, especially when it is remembered that the Company's area of supply has remained unextended for thirty years.

The nickel process of gas purification from sulphur compounds, after being thoroughly proved at the Old Kent Road works, is being rapidly extended at the other chief manufacturing stations. At no distant date the bisulphide impurity, the removal of which had baffled engineers and chemists for three-quarters of a century, will be completely eliminated from the whole of the gas supplied by this Company.

The Company's accident fund has again been officially certified for a further period of five years. Its working is, and has been from the commencement, a remarkable testimony to the advantages of mutually administered benefit funds when unhampered by the routine inseparable from Government Departments.

As regards co-partnership, the Company's relations with its workpeople were never more cordial, nor were the employees ever more loyal in their endeavours to carry out its spirit.

Two Directors (Mr. Charles Carpenter and Mr. Laurence W. S. Rostron) and one Auditor (Mr. C. P. Crookenden) retire by rotation. They are eligible, and offer themselves for re-election.

CHARLES CARPENTER, Chairman.

709, Old Kent Road, S.E., Jan. 28, 1914.

The Accounts.

The following are the principal portions of the accounts accompanying the preceding report.

The first two statements relate, as usual, to the stock and loan capital. The former sets forth that the standard rate of 4 per cent. is payable on £6,011,224 and £418,671 (Act of 1901) of stock; while the latter shows that the loan capital, the rate of interest on which is 3 per cent., amounts to £1,798,994 and £96,451 (Act of 1901). The third statement is the capital account. It stands as follows: Amount received, £5,328,820; nominal amount added by conversion (less premium), £2,996,520—total, £8,325,340. The items of expenditure are as follows:—

Capital account to June 30, 1913		£5,090,873 3 10
Expenditure during half year to Dec. 31, 1913—viz.:		
New and additional mains and services	£1,360 5 7	
New and additional meters	1,272 19 5	
New and additional stoves	2,122 19 8	
	4,756 4 8	
Total expenditure		£5,095,629 8 6
Balance		233,190 11 6
		£5,328,820 0 0
Nominal amount added by conversion, less premium		2,996,520 0 0
Total		£8,325,340 0 0

The net revenue account shows a sum of £240,421 11s. 3d. applicable to dividend on the ordinary stock. Following this are the statements relating to the reserve, renewal, and insurance funds. They show that the balances on Dec. 31 were as follows: Reserve fund, £192,538; renewal fund, £23,550; insurance fund, £20,354.

The following tables relate to working:—

Statement of Gas Made, Sold, &c.

Quantity Made.	Quantity Sold.		Total Quantity Accounted for.	Number of Public Lamps.
	Public Lights (estimated).	Private Lights (per Meter).		
Thousands.	Thousands.	Thousands.	Thousands.	
7,099,900	192,513	6,439,520	6,716,567	24,713

Statement of Coal.

In Store June 30, 1913.	Received During Half Year.	Carbonized During Half Year.	Used During Half Year.	In Store Dec. 31, 1913.
Tons.	Tons.	Tons.	Tons.	Tons.
113,574	631,936	557,553	796	187,161

Statement of Residual Products.

Description.	In Store June 30, 1913.	Made During Half Year.	Used During Half Year.	Sold During Half Year.	In Store Dec. 31, 1913.
Coke—tons	20,876	344,527	72,674	222,692	70,037
Breeze—yards	12,909	119,359	58,625	54,907	18,736
Tar—gallons	380,608	5,423,066	5,339,470	19,211	444,993
Ammoniacal liquor—butts	7,069	213,113	209,942	..	10,240

The following is the revenue account:—

Expenditure.

Manufacture o. gas—		
Coal into store, including £3918 12s. 3d. for London Port and tonnage dues	£466,089 19 1	
Purification	20,481 12 7	
Salaries of Engineer and Officers at works	17,492 7 8	
Wages (carbonizing)	50,801 5 11	
Repairs and maintenance of works and plant, less £3441 5s. 9d. received for old materials	121,635 14 6	
		£676,500 19 9
Co-partnership		20,000 0 0
Distribution of gas—		
Repair, maintenance, and renewal of mains and service-pipes	£43,643 6 9	
Salaries and wages of officers, including rental clerks	21,257 8 0	
Repair and renewal of meters	35,684 2 8	
Repair and renewal of stoves	42,608 18 4	
Repair and renewal of gas-fittings	47,948 7 9	
		191,142 3 6
Public lamps, labour and materials £17,161 13s. 1d., less £14,250 19s. 11d. received for the same		2,910 13 11
Rents, rates, and taxes—		
Rents payable	£1,433 14 4	
Rates and taxes	55,509 8 4	
		56,943 2 8
Management—		
Directors' allowance	£2,818 18 1	
Salaries of Secretary, Accountant, and clerks	4,309 4 4	
Collectors { Ordinary	5,806 8 6	
Collectors { Slot meter	10,692 3 11	
Stationery and printing	3,750 9 10	
General charges	10,520 19 7	
Company's Auditors	112 10 0	
		38,010 14 3
Miscellaneous—		
Law charges		1,135 7 7
Bad debts		1,832 9 0
Stolen from 1763 slot meters broken open		221 1 5
Superannuation, sick, and accident funds		6,095 9 11
National Insurance Act charges		1,554 14 0
Gas Referees and Official Auditor		320 19 3
Total expenditure		£996,667 15 3
Balance carried to net revenue account		152,462 17 4
		£1,149,130 12 7

Receipts.

Sale of gas—		
Michaelmas, at 2s. 2d. per 1000 feet	£278,954 3 2	
Christmas, at 2s. 2d. per 1000 feet	394,109 7 10	
	£673,063 11 0	
Public lighting	17,295 9 3	£690,359 0 3
Company's meters at rent: Ordinary, 95,754; slot, 269,921	£41,879 15 4	
Company's stoves at rent: Ordinary, 82,807; slot, 223,488; fires, 44,540	36,632 15 7	
Gas-fittings	49,817 17 0	
		128,330 7 11
Residual products—		
Coke, less labour and cartage	£199,323 19 10	
Breeze, " "	3,805 5 0	
Tar and tar products, less labour	54,276 19 0	
Sulphate of ammonia " "	71,578 19 0	
		328,985 2 10
Rents receivable		1,356 4 1
Transfer fees		99 17 6
Total receipts		£1,149,130 12 7

Total amount paid in salaries for half year, £45,024 3s. 4d.
" " " wages " £306,639 6s. 0d.

The remaining statement is the balance-sheet, which gives the value of the stores in hand at the close of the half year as follows: Coal, £135,691; coke and breeze, £46,824; tar, ammonia, and products, £93,658; and sundry plant and stores, £339,598. The figures this time last year were: Coal, £47,967; coke and breeze, £7935; tar, ammonia, and products, £66,844; and sundry plant and stores, £338,403.

A sum of £40,477, co-partnership bonuses and savings, has been deposited with the Company; and the total of the superannuation and guarantee funds is £68,771. The figures last year were £31,174 and £65,648.

COMMERCIAL GAS COMPANY.

THE following is the report, for the six months ended Dec. 31, which the Directors of the Commercial Gas Company will present at the half-yearly meeting on Thursday.

The Directors submit the accounts for the half year ended Dec. 31. The revenue account shows a net profit for the half year of £64,649 9s. 7d., which, added to the balance of £92,866 11s. 6d. brought forward from the previous half year, produces a net revenue balance of £157,516 1s. 1d. Deducting therefrom £7700 16s. 9d. for interest, there remains standing to the credit of the net revenue account a balance of £149,815 4s. 4d. available for dividend. The Directors recommend the payment of dividends thereout at the rates of £5 9s. 4d. per cent. per annum upon the 4 per cent. stock of the Company, and of £5 6s. 8d. per cent. per annum upon the 3½ per cent. stock, both less income-tax. The balance of the net revenue will be carried forward to the next half year.

Messrs. W. G. Bradshaw, W. Hunter, and R. Y. Bevan, three of the Directors, retire by rotation, and, being eligible, offer themselves for re-election. Mr. G. W. Ilsley, one of the Auditors, will go out of office by rotation, and, being eligible, offers himself for re-election.

WILLIAM GRAHAM BRADSHAW, Chairman.

Jan. 28, 1914.

The Accounts.

The accounts accompanying the report consist of the usual set of statements. They show that the paid-up stock on the 31st of December

amounted to £996,405; that £1,076,875 had been added by conversion, making £2,073,280; and that £149,298 remained unissued out of the total authorized capital (including premiums) of £2,235,000. The total amount borrowed on the above-named date was £339,062 10s., and £135,937 10s. was added by conversion; making a total of £475,000, and leaving £79,226 to be borrowed out of the £550,000 authorized. Capital account receipts amount, with premiums, to £2,606,065 4s. 5d. The expenditure stands at £1,447,564 12s. 3d., with a nominal amount of £1,212,812 10s. added by conversion—together, £2,660,377 2s. 3d. There is thus a balance of £54,311 17s. 10d. carried to the balance-sheet. A sum of £1318 was expended during the half year on new and additional mains, services, stoves, &c.; but £1450 is credited for prepayment meters and fittings. The reserve fund amounted at the close of the half year to £38,893, and the insurance fund to £33,170.

The following is the revenue account:—

Expenditure.

Manufacture of gas—			
Coal and oil, including dues, carriage, unloading, and trimming	£107,853 11 10		
Salaries of Engineer and officers at works	2,787 6 0		
Wages (carbonizing)	11,098 2 10		
Purification, including labour	1,379 0 5		
Repair and maintenance of works and plant, materials and labour (less £172 9s. 8d. received for old materials)	27,198 13 3		
		£150,316 14 4	
Profit sharing		3,784 19 6	
Distribution of gas—			
Salaries and wages of officers (including rental clerks)	£5,780 6 9		
Repair, maintenance, and renewal of mains and services, material and labour	10,272 11 9		
Repair and renewal of meters	3,030 1 2		
" " " " stoves	11,374 2 0		
" " " " prepayment meters and fittings	11,093 7 11		
Maintenance of mantles and fittings	874 3 0		
		42,424 12 7	
Public lamps—lighting and repairing		2,742 12 6	
Rent, rates, and taxes		15,381 8 3	
Management—			
Directors' allowance	£1,250 0 0		
Company's Auditors	75 0 0		
Salaries of Secretary, Accountant, and clerks	887 5 3		
Collectors' salaries and commission	1,590 18 4		
Prepayment meter collection	3,409 6 4		
Stationery and printing	1,058 14 1		
General charges	1,844 1 3		
		10,115 5 3	
Bad debts		398 9 6	
Law and parliamentary charges		216 2 2	
Superannuations and allowances and Workmen's Benefit Society, &c.		2,329 9 6	
Official officers, &c.		126 16 4	
National Health and Unemployment Insurance		542 14 11	
Total expenditure		£228,379 4 10	
Balance carried to net revenue account		64,649 9 7	
		£293,028 14 5	

Receipts.

Sale of gas—			
Per meter (number in use, 111,947) at 2s. 4d. per 1000 cubic feet	£195,883 0 11		
Public lighting and under contracts	5,593 15 8		
	£201,478 16 7		
Less discounts and allowances	4,074 8 6		
		£197,404 8 1	
Rental—			
Meters (23,931)	£2,839 18 9		
Stoves (73,818)	11,804 18 3		
Prepayment meters and fittings (87,309)	19,023 11 5		
Maintenance of mantles and fittings	818 14 5		
		34,487 2 10	
Residual products—			
Coke, less £3522 2s. 2d. for labour	£36,304 8 5		
Breeze, less £719 5s. 11d. for labour	1,308 16 7		
Tar	10,917 3 3		
Ammoniacal liquor and sulphate of ammonia	12,521 5 3		
		61,082 13 6	
Miscellaneous receipts—			
Rent receivable	£14 12 6		
Transfer fees	39 17 6		
		54 10 0	
Total receipts		£293,028 14 5	

The following statements relate to the working:—

Statement of Coal and Oil.

—	In Store June 30, 1913.	Received During Half Year.	Carbonized During Half Year.	Used and Sold During Half Year.	In Store Dec. 31, 1913.
	Tons.	Tons.	Tons.	Tons.	Tons.
Coal	25,635	94,775	97,665	554	22,190
Oil—gallons	498,199	1,244,741	1,208,786	..	534,154

Statement of Residual Products.

Description.	In Store June 30, 1913.	Made During Half Year.	Used During Half Year.	Sold During Half Year.	In Store Dec. 31, 1913.
Coke—tons	6,624	61,041	7,475	44,160	16,030
Breeze—tons	2,610	8,409	..	6,892	4,127
Tar—gallons	336,788	1,194,505	..	1,207,657	323,636
Ammoniacal liquor—butts of 108 gallons	5,647	35,877	31,773	..	9,751
Sulphate of ammonia—tons	200	1,039	..	1,109	130

Statement of Gas Made, Sold, &c.

Quantity Made.	Quantity Sold.		Quantity Accounted for.	Number of Public Lights.
	Public Lights and under Contracts (estimated).	Private Lights, per Meter.		
Thousands.	Thousands.	Thousands.	Thousands.	
1,883,197	36,771	1,680,650	1,745,669	3897

The remaining statement is the balance-sheet, which gives the value of the stores in hand at the close of the half year as follows: Coal, oil, &c., £26,665; coke and breeze, £10,344; tar, ammoniacal liquor, sulphate of ammonia, &c., £9277; sundry stores, £34,976—total, £81,262. The figures this time last year were: Coal, oil, &c., £18,302; coke and breeze, £4111; tar, ammoniacal liquor, sulphate of ammonia, &c., £11,186; sundry stores, £33,760—total, £67,359.

GAS REFEREES' "NOTIFICATION" FOR 1914.

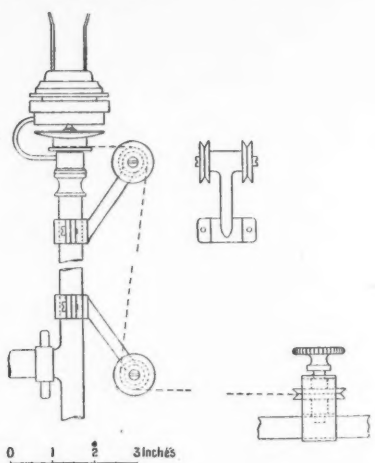
THE "Notification" of the Metropolitan Gas Referees for the current year was issued last Wednesday, and we mention below the principal points in which it in any way differs from its immediate predecessor.

In the section giving directions for making testings with the "Metropolitan" No. 2 burner these words have been inserted:

> In order that the gas examiner may adjust the position of the air damper without leaving his seat, a milled head is carried by the connecting-rod near the end of the scale connected by a string with the damper, as described in Appendix D (4). After waiting three minutes, in order to allow the flame to attain its maximum development of light, the gas examiner shall satisfy himself that the regulation of the air supply is correct, and shall then make his observations of illuminating power in the following manner.

The remainder of the paragraph stands. We give below the portion of the appendix referred to.

Two brackets, carrying two guide-pulleys each, are clamped to the vertical tube which carries the argand burner. A third bracket is clamped to the connecting-rod near the inner end of the scale. This carries a grooved pulley with a milled head, which may be turned by the gas examiner. A string, kept taut by a spring, is passed round the five pulleys and the neck of the damper. A specimen of the arrangement [shown below] may be seen at the Gas Referees' office.



In Appendix A, giving directions for using the Harcourt ten-candle pentane lamp, it is mentioned (p. 12) that when the lamp is in use the stopcocks are to be regulated so that the tip of the flame is about half way between the bottom of the mica window and the cross-bar, as indicated by a dotted line in an illustration given on the succeeding page.

In Appendix L, in which Mr. Boys' gas-calorimeter is described and illustrated, it is pointed out that the graduated vessel shown, and the one that is used for measuring the condensed water "shall both have been previously examined and certified by the Gas Referees." An impression of the stamp (an illustration of which is given) on the base of the vessel is to be accepted as proof that this has been certified. In the succeeding paragraph it is directed that the thermometers used in the testings must bear a distinctive number, "which will be recorded on a certificate of correctness issued by the Gas Referees;" and no thermometer which has not been certified by them is to be used in testings.

THE RELATION OF FLUE VENTILATION TO HEATING EFFICIENCY IN GAS-FIRES.

II.

By W. J. A. Butterfield, M.A., F.I.C., Assoc.Inst.C.E.

The article by the writer which was published in the "Journal" for July 22 last, p. 232, gave the results of approximate determinations of the flue-gas losses with two types of gas-fire, which were examined at the time primarily with a view to comparing their radiation efficiency. The flue-gas loss determinations were stated to be comparable as between the two fires, but not to be correct absolutely. Determinations by more accurate methods were then in progress; and these have now been completed.

Determination of Carbonic Acid in the Flue Gases.

The former determinations of flue-gas losses were only approximately correct, chiefly because the determinations of carbonic acid in the flue gases, on which the calculation of the composition of the latter depended, were made on a few samples of flue gas taken at intervals during the progress of the radiation tests. Determinations of the proportion of carbonic acid in the flue gases have now been made by a continuous method, which gives the average proportion of carbonic acid in the gases over a period of about three-quarters of an hour. The method used is a gravimetric one similar to that of Haldane and Pembrey for the determination of carbonic acid in air, which the writer has used in investigations of the ventilation of the Debating Chamber of the House of Commons and other buildings, in which the highest degree of accuracy has been desirable. The precautions necessary in its use have been described by him in a paper published in "The Analyst" in June, 1909 [see the "Journal," Vol. CVI., p. 373]. The method is applicable, with only slight modification, to the determination of carbonic acid in flue gases, and gives a more trustworthy average, for a considerable period, of the proportion of carbonic acid in the gases than any volumetric method of which the writer is aware.

Determination of the Temperature of the Flue Gases.

For calculating the flue-gas losses an accurate determination of the mean temperature of the gases passing through the flue-vent is as important as the accurate determination of the average proportion of carbonic acid in the gases. The difficulty of ascertaining the mean temperature of these gases has been referred to by writers in the "Journal." The method which the writer has adopted in this and in other investigations which aim at giving accurate results, has been to arrange two verified thermometers, one of which has an unusually long bulb, in position in the flue-vent, as shown in the cross sectional view of the flue-vent of the "Apollo" fire given in fig. 1.

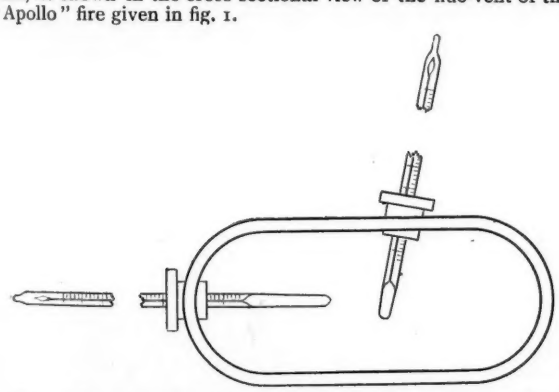


Fig. 1.—Cross Section of "Apollo" Flue-Vent, showing the Position of the Thermometers.

It was found by comparison with readings made with a greater number of thermometers that the average readings obtained with the two thermometers so placed represented as fairly as possible the mean temperature of the flue gases; while two bulbs caused less obstruction of the flue-way than a greater number. The thermometers were read at intervals of half-a-minute during the continuance of the test; and the average of the readings thus obtained was taken as the mean temperature of the gases passing through the flue-vent.

Scope of the Present Investigations.

The method of determining the flue-gas losses, by estimation of the mean proportion of carbonic acid in, and observations of the mean temperature of, the flue gases, having been tested and found satisfactory by some control determinations which it is unnecessary to refer to in detail, it was applied to the study of the questions which had been raised as to whether the construction of gas-fire represented by the Davis "Apollo" fire carried off by way of the flue a greater proportion of the heating value of the gas consumed than a Wright's "Mascot" fire, which was taken as typical of a construction which had been claimed to give the greatest heating efficiency. The two fires had the same number of flames and the same width of fire front; and the genera differences in their design have been indicated in articles which have appeared in the "Journal" during the past year. A comparison of the flue-gas losses of the two fires would, however, obviously be fair only when the whole of the products of combustion from both fires were being removed by way of the flue-vent. It was found by gravimetric determinations of the proportion of carbonic acid in the air slightly above the rim of the canopy, both in the centre and near the cheeks, that no products of combustion escape in front of the Davis "Apollo" fire when the fire is used without an elbow or flue-pipe, and with the gas consumption at the normal rate of about 25 cubic feet per hour. Similar gravimetric determinations on the "Mascot" fire without an elbow or flue-pipe showed that the air slightly above the rim of the canopy contained 113 volumes of carbonic acid per 10,000 above the 4·7 volumes per 10,000 which were present in the air of the room as supplied to the fire at the time. The samples of the air of the room were for this purpose taken at the level of the burners and 15 inches in front of them.

The gravimetric determinations of carbonic acid immediately above the front edge of the canopy were checked by the "Shadowgraph" test; and the results obtained by the two methods were in all cases found to exactly tally—*i.e.*, an analysis which showed no products around the outer rim of the canopy gave a negative indication with the "Shadowgraph" test, while even the smallest proportion of products escaping gave a definite positive indication with the test. The trustworthiness of the "Shadowgraph" test was thus again confirmed.

An elbow was then attached to the "Mascot" fire and successive determinations were made of the proportion of carbonic acid in the air slightly above the rim of the canopy with small increments in the length of the flue-pipe attached to the elbow until the minimum length of flue-pipe was found at which the whole of the products of combustion from the fire were carried through the flue-vent. It was found that with an elbow and flue-pipe giving a vertical height of 12 inches from the horizontal axis of the flue-vent the air slightly above the rim of the canopy contained in the centre 14·4 volumes of carbonic acid per 10,000, and near the cheeks 21·9 volumes per 10,000 above the 5·5 volumes per 10,000 which were present in the air as supplied to the fire. Thus, with the pull of 12 inches vertical length of elbow and flue-pipe, the "Mascot" fire failed to carry off its products of combustion through the flue-vent so completely as did the "Apollo" fire without elbow or any flue-pipe. With a vertical height of 1 ft. 9 in. of elbow and flue-pipe, the "Mascot" fire was found to carry the whole of its products of combustion away through the flue-vent, and hence, so far as flue-gas losses are concerned, the "Mascot" fire with this length of flue-pipe must be regarded as being comparable with the Davis "Apollo" fire without elbow or flue-pipe. That is to say that, if the two fires were to be fitted in a room, the chimney of which exerted no natural pull, it would be necessary, in order to avoid the escape of products of combustion into the room, to fit an elbow and flue-pipe giving together a vertical length of about 21 inches to the "Mascot" fire; whereas no elbow or flue-pipe would be necessary with the Davis "Apollo" fire to fulfil the same condition.

The "Mascot" fire, with 21 inches vertical length of elbow and flue-pipe, being therefore equivalent to the Davis "Apollo" fire without elbow or flue-pipe, so far as the removal of products of combustion from the room in which it is used is concerned, the flue-gas losses of the two fires in these conditions are strictly comparable. If, in order to overcome down-draught in the chimney or in order to increase the ventilation through the fire, it is considered necessary to use an elbow and vertical flue-pipe on the Davis "Apollo" fire, the vertical length of the flue-pipe so used would have, in the case of the "Mascot" fire, to be additional to the 21 inches vertical length of flue-pipe already referred to in order to achieve the same object.

In order to ascertain the relative effect on the flue-gas losses of the two fires of increased chimney pull, successive increments of 12 inches in the length of flue-pipe were made with both the fires, and the proportion of carbonic acid in the effluent gases and the temperature of the effluent gases at the flue-vent were determined in each case. These determinations were made up to a maximum vertical height of elbow and flue-pipe of 6 feet.

The specimens of the "Apollo" and "Mascot" fires on which these investigations were made were new ones bought by the writer from the stock of one of the London gas companies in the winter of 1912-13. The investigations were made on the gas supplied to Westminster, which was fairly constant in calorific power throughout the series of tests. The mean calorific power was, however, about 545 B.Th.U. gross and 485 B.Th.U. net per cubic foot; whereas, in the former series of investigations made at Luton on the radiation efficiency of the two fires, the calorific power of the gas used averaged about 605 B.Th.U. gross and 535 B.Th.U. net per cubic foot. On this account, the temperatures of the products at the flue-vent and the flue-gas losses found in the two series of investigations are not on the same basis; and the differences in the observations recorded are probably mainly

due to the difference in the calorific power of the gas and not to the differences in the methods of observation.

RESULTS OF THE INVESTIGATIONS.

The results of the observations of the mean temperature of the products of combustion at the flue-vent of the two fires are shown in the curves given in fig. 2.

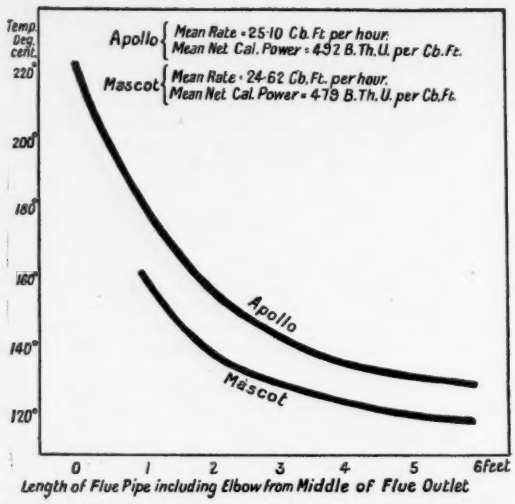

Temp. Deg. cent.
Apollo { Mean Rate = 25·10 Cb. Ft. per hour. Mean Net Cal. Power = 492 B.Th.U. per Cb. Ft.
Mascot { Mean Rate = 24·62 Cb. Ft. per hour. Mean Net Cal. Power = 479 B.Th.U. per Cb. Ft.
220°
200°
180°
160°
140°
120°
Apollo
Mascot
0 1 2 3 4 5 6 feet
Length of Flue Pipe including Elbow from Middle of Flue Outlet

Fig. 2.—Effect of Variation of Length of Flue-Pipe on the Temperature of the Flue Gases above the Air of the Room, Corrected for Rate and Calorific Power of the Gas.

The variations in the corrected rate of consumption and in the calorific power throughout the series of observations for each fire did not exceed 2 per cent. on either side of the mean, and within this range of variation it was assumed that the temperature of the flue gases varied directly with the rate of consumption and the calorific power of the gas, and corrections were applied accordingly to the observed temperatures, with a view to eliminate the effect on them of the slight fluctuations in the rate of consumption and the calorific power of the gas.

It will be seen from the curves in fig. 2 that, even allowing for the rate of consumption and the calorific power of the gas having being slightly higher during the observations on the "Apollo" fire, the temperature of the gases issuing from the flue-vent of this fire is for the same length of flue-pipe appreciably higher than with the "Mascot" fire. A cursory consideration of this fact may lead to the conclusion that the flue-gas losses would be higher with the "Apollo" fire; but it is obvious that the flue-gas losses depend not only on the temperature of the gases, but also on their volume. The volume of gases passing through the flue-vent with the same flue draught depends partly on the cross sectional area of the flue-vent, but also on the construction of the fire as regards the height of the fire-brick back, the position and shape of the canopy, &c. The cross sectional area of the flue-vent is about 9 square inches with both fires; but the flue-vent of the "Mascot" fire is somewhat flatter and wider than that of the "Apollo" fire.

The construction of the "Mascot" fire has the effect of diluting the products of combustion with a greater proportion of air, provided the flue draught is sufficient to remove all the products of combustion by way of the flue-vent. But notwithstanding the equal cross sectional area of the flue-vent of the "Mascot" fire, the whole of the products of combustion pass through it only under the stimulus of elbow and flue-pipe or chimney draught; whereas they pass away wholly through the similar flue-vent of the "Apollo" fire without any stimulus. The flue-vent of the "Apollo" fire is therefore more efficient, and the two fires do not become comparable in respect of competence to remove the whole of the products of combustion by way of the flue until the "Mascot" fire has been provided with 21 inches additional vertical height of flue-pipe. The volume of gases passing through the flue-vent with the two fires compared in these conditions is shown in fig. 3, in cubic feet of flue gases per cubic foot of gas consumed.

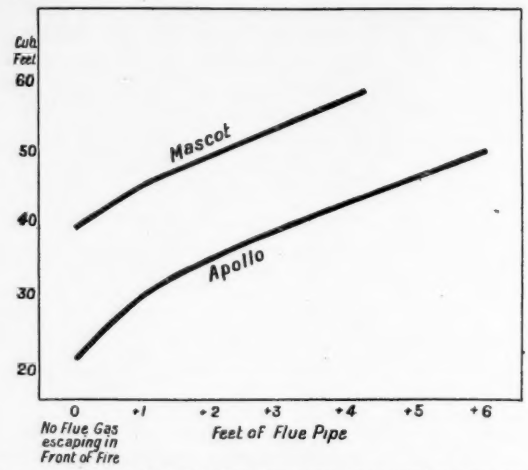


Fig. 3.—Volume of Moist Flue Gases per Cubic Foot of Gas Consumed, with Increments of Flue-Pipe on to Length Necessary to Withdraw all the Products.

It will be seen that the volume of flue gases in similar conditions is always greater with the "Mascot" fire than with the "Apollo" fire.

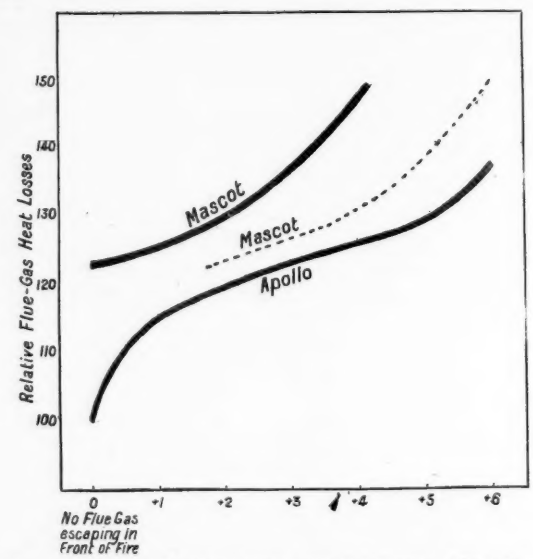


Fig. 4.—Relative Flue-Gas Losses, with Increments of Flue-Pipe on to Length Necessary to Withdraw all the Products.

The net results of the observations of temperature of the flue gases at the flue-vent and of the volume of flue gases, as shown in the curves in figs. 2 and 3, is that the flue-gas losses for the two fires in comparable conditions are as shown by the curves in fig. 4, which give the comparative values. The flue-gas loss

DETERMINATION OF FLUE-GAS LOSSES FROM "APOLLO" AND "MASCOT" FIRES.

1. Fire and Vertical Length of Elbow and Flue-Pipe.	2. Corrected Rate of Consumption. Cubic Feet per Hour.	3. Temperature above Air of Room of Flue Gases at Flue Vent for Rate in Column 2.	4. Percentage of CO_2 in Dry Flue Gases, less CO_2 in Air Supply.	5. Volume of Moist Flue Gases. Cubic Feet at 60° Fahr. and 30 in.	6. Relative Values of Flue-Gas Losses. Loss by "Apollo" without Elbow taken as = 100.
Nil "Apollo"	25·09	224° C.	2·61	518	100·0
,, "Mascot"	26·16	225 ,,	2·27	..	..
1 ft. "Apollo"	24·62	179·3 ,,	1·75	743	115·9
,, "Mascot"	25·53	163 6 ,,	1·565	..	..
1 ft. 9 in. ,,	25·44	142·5 ,,	1·322	1007	122·3
2 ft. "Apollo"	25·44	159·7 ,,	1·496	894	119·6
,, "Mascot"	24·77	139·0 ,,	1·288	1007	122·4
3 ft. "Apollo"	25·01	142·9 ,,	1·299	1007	123·5
,, "Mascot"	25·63	130·8 ,,	1·132	1180	126·6
4 ft. "Apollo"	24·81	135·8 ,,	1·201	1079	126·6
,, "Mascot"	25·62	125·3 ,,	1·046	1274	130·7
5 ft. "Apollo"	24·84	131·7 ,,	1·140	1135	129·1
,, "Mascot"	25·89	121·6 ,,	0·962	1397	140·5
6 ft. "Apollo"	24·42	125·9 ,,	1·020	1245	137·8
,, "Mascot"	24·45	119·0 ,,	0·888	1427	149·6

being lowest for the "Apollo" fire without elbow or flue-pipe, this has been assigned the value of 100, and the other flue-gas losses are stated in ratio to that value. The chief data, on which the curves in Figs. 2, 3, and 4 have been based, are collected in the preceding table.

It is clear from the curves that, while with gas of a net calorific power of about 485 B.Th.U. per cubic foot, the "Apollo" fire carries off the whole of the products of combustion by way of the flue-vent with the minimum flue-gas loss (which is here taken as equal to 100), the "Mascot" fire does the same only with a flue-gas loss equal to 122·3 on the same basis. The effect of putting an elbow on the "Apollo" fire is to reduce considerably the difference between the flue-gas losses of the two fires; but the "Apollo" continues at all points to show a considerably smaller flue-gas loss than the "Mascot" fire. Even if the two fires are compared with the same length of flue-pipe (the dotted curve for the "Mascot" fire in fig. 4 facilitates this comparison), irrespective of the need for same to prevent the products of combustion from escaping from under the canopy into the room, the heat losses by way of the flue-pipe are appreciably lower with the "Apollo" fire than with the "Mascot."

Conclusions from the Foregoing Results.

The investigations demonstrate clearly that with the type of construction adopted in the "Apollo" fire, as compared with that followed in the "Mascot" fire, more heat is rendered available for heating the room to the extent of from 3 to 7 per cent. of the net calorific power of the gas consumed. The greater heat thus made available for heating the room by the "Apollo" type of construction is probably largely in the form of convected heat, as the higher temperatures at the flue-vent of the "Apollo" fire suggest that the upper part of the body of this fire is also at a higher temperature than that of the "Mascot." The previous investigations by the writer showed that the radiation efficiency of the "Apollo" fire was not less than that of the "Mascot." Broadly, therefore, the "Apollo" type of construction involves no loss of radiant efficiency, an increase in the heating of the room by convection, and a reduction in the heat losses by way of the flue-pipe when the fires are used in similar conditions.

A SUPPLEMENTARY OBSERVATION.

The proportion of the total products of combustion which escape in front of a gas-fire when the whole of the products are not carried off by way of the flue-vent has not hitherto, so far as the writer is aware, been accurately determined in any tests of gas-fires. The "Shadowgraph" test gives, for practical purposes, a

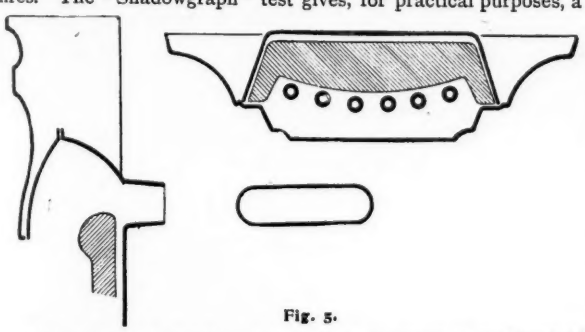


Fig. 5.

sufficiently clear indication of the extent of escape of products of combustion; but it might be suggested that even with a very extensive and dense shadow indication by that test, the proportion of products escaping is, in reality, small. It thus seemed to the writer to be a matter of collateral interest to ascertain on a gas-fire which was defective in respect of complete ventilation through the flue-vent, the relative proportions of the products of combustion or flue gases escaping: (1) By way of the flue-vent; and (2) in front of the canopy when the fire was used without elbow or flue-pipe. The fire used for these observations was of a type which has been largely used, and a clear idea of the construction of its canopy chamber is given in fig. 5.

The width across the radiants is 10 inches. The number of fuel columns is seven; and the vertical distance between the bottom of the canopy and the top of the horizontal fuels is $3\frac{1}{2}$ inches. The flue outlet is about 6 inches by $1\frac{1}{2}$ inches in cross section, and rounded at the ends; and a horizontal line through its centre is about $1\frac{3}{8}$ inches above the front edge of the canopy. This indicates the height of chimney afforded by this construction. This height is, in the circumstances, insufficient to ensure the whole of the products of combustion passing away through the flue-vent, unless a flue-pipe is provided. In this respect the fire does not, of course, comply with the standard of hygienic efficiency observed in the "Apollo" type of fire.

A very neat method of ascertaining the proportion of the products of combustion escaping in front of the canopy was suggested to the writer by Mr. W. R. Twigg, the Technical Manager of the Davis Gas-Stove Company, Limited. It had the advantage of dispensing with an anemometer or other mechanical appliance for determining the velocity of the gases through the flue-vent; and thus the interference which such an appliance would inevitably cause in the flow of the flue gases was avoided. The method was as follows.

The temperature of the flue gases at the flue-vent without elbow or flue-pipe was ascertained. An elbow and 2 feet of flue-pipe were then fitted to the flue-vent, and a damper was used to control the flow of flue gases until exactly the same temperature was found at the flue-vent as when the fire was used at the same rate of consumption without elbow or flue-pipe. The temperature at the flue-vent being the same, it was reasonable to infer that the rate of flow and volume of the flue gases were the same in the two cases. A determination of the proportion of carbonic acid in the flue gas was made; and then, without otherwise altering the conditions, a small stream of carbonic acid which had passed through a small experimental meter for measurement, was introduced at the base of the flue-pipe. A determination of the carbonic acid in the flue gases, after this addition, was made; and from the ratio of the added carbonic acid to the difference between the proportions of carbonic acid found in the flue gases in the two determinations, the rate of flow through the flue-vent of carbonic acid from the gas consumed was calculated. The difference between this rate of flow and the rate of total production of carbonic acid from the gas showed the rate of escape in front of the canopy of carbonic acid from the gas consumed. A determination made in this way indicated that with the fire under observation, when used without elbow or flue-pipe, about 28 per cent. of the products of combustion escaped in front of the canopy. If some allowance be made for the slight obstruction of the flue-vent caused by the two thermometer bulbs, it is tolerably certain that the fire on which the tests were made would, with a wholly unobstructed flue-vent, allow one-fourth of the total products of combustion to escape in front of the canopy when no elbow or flue-pipe has been fitted to the fire.

[The foregoing investigations were made by the writer at the request of the Davis Gas-Stove Company, Limited, but were made by him in his own laboratory, independently of their technical staff and equipment.]

KOPPERS' VERTICAL RETORTS AND COKE-OVENS.

An Improved Design.

There has recently been published the specification of a patent (No. 460,517 of 1913) taken out for France by Herr Heinrich Koppers for improvements in vertical gas-retorts and coke-ovens. The nature of the improvements will be gathered from the following translation of the specification.

The object of the invention is: (1) To establish a simple circulation, as free as possible from leakage, of the hot gases in the settings of vertical retorts. (2) Place the retorts, as far as possible, in the part of the setting where the heat is greatest. (3) Keep the space under the retorts free, so that the lining can be removed from the chambers. This object is accomplished by conveying the hot gases horizontally, in the heating walls surrounding the retorts or chambers, from their exit from the heat regenerator to their entrance to the chambers, and especially by means of heating flues which are constructed around the chambers, and terminate at their mouth and extremity in regenerators running laterally along the full height of the retort. The single current of heat thus becomes a bond of union in the parts situated at the same altitude in a waste heat and air regenerator; and this bond does not alter its direction vertically. The result of the union is that there is complete utilization of heat, because the hot gases also pass horizontally through the regenerators.

In order to form certain zones in heating, and especially to obtain continuous distillation, the heat regenerators, conformably with a development of the present invention, are first divided by horizontal partitions into superposed compartments, each one of which can be separately regulated. This is effected by the working of dampers, by the aid of which the entrance of air into a preliminary chamber common to all the superposed compartments, or, on the other hand, the escape of the utilized air, can be controlled. Owing to this device, it is now possible to check from the outside a particularly high degree of heating of certain layers. This system of regulation is completed by the employment of chambers of which the profile has a greater slope at the top than in the lower part, because during emptying there is no cause for interruption of the filling, which is often brought about by the considerable heating of some horizontal layers.

The whole of the installation, which has to work at intervals or without stoppage, is clear and simple in construction, especially as regards the heat flues. The space below the setting is quite free, and the chambers, particularly in the case of the heat regenerators on either side, are in the centre of the stream of heat. Owing to the natural rise of the zones of heat one above the other towards the exterior, the loss of heat by radiation is very small indeed.

Two forms are represented in the diagrams on next page. Figs. 1 and 2 show in vertical section and plan an installation with heat regenerators on the right and left of the retort chamber; while figs. 3 and 4 show one with hot air and waste heat regenerators placed in alternation on one side of the chamber.

The chambers or retorts A, arranged in pairs side by side (see figs. 1 and 2), and supported on pillars B, are closed at the top

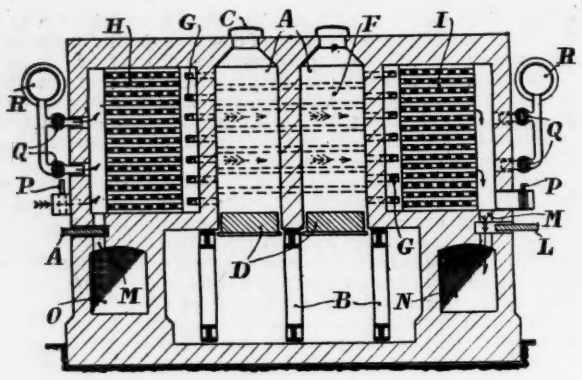


Fig. 1.

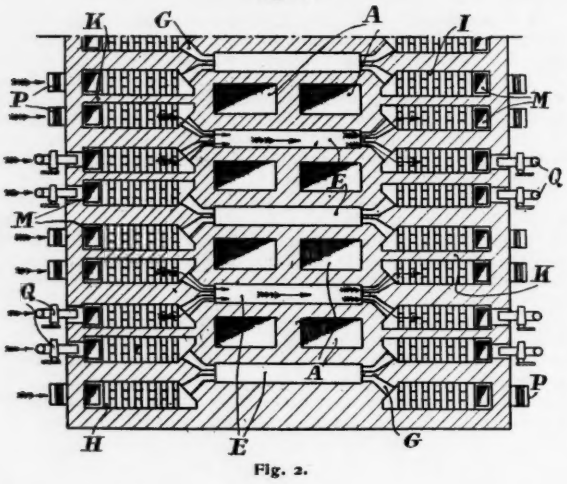


Fig. 2.

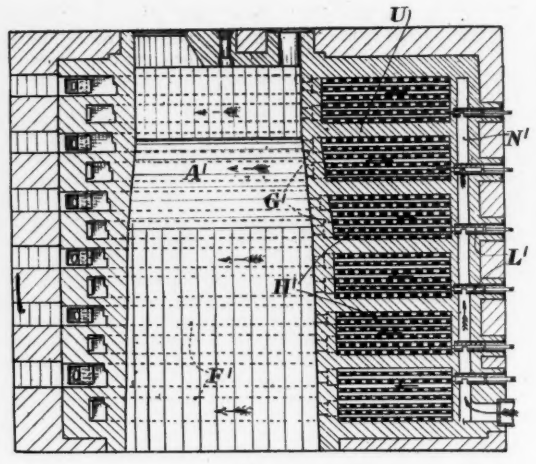


Fig. 3.

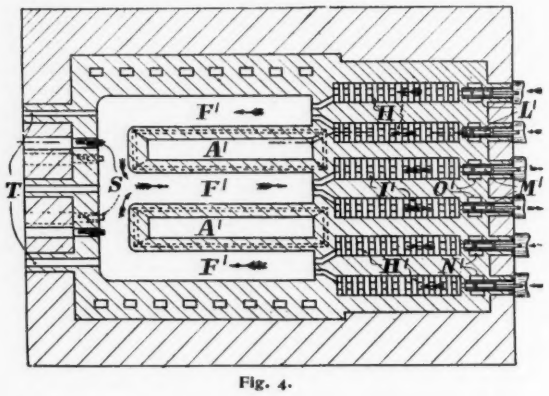


Fig. 4.

by lids C, and at the bottom by sole-pieces D; but the shape of the retorts may be such as to allow of continuous work. Each pair of retorts is surrounded by two heating walls E (fig. 2), which are divided into horizontal separate passages (fig. 1). The heating walls communicate immediately by nozzle-shaped branches G with the heat regenerators H I. These are divided into two parts by partitions K (fig. 2), and the parts are in turn connected with the heating walls in the front and back of the retorts. All the regenerators have branches M on the heat flues N O. These branches can be closed with dampers L, and they are always provided with air dampers P and branches Q on the gas-pipe R, alternating with each other.

The peculiar feature of the working is that when, for example, communication between all the heat regenerators H and the waste heat passage O is cut off by shutting the damper, they are then, according to their order of juxtaposition, fed with gas through the pipe R and air through the orifice of the branch P. After passing through the branches G, combustion is produced in the heating walls E, while the waste heat enters through the orifices G into the regenerators I. Here the branches Q for the gas and the air dampers P are shut, while the dampers L are pulled out, and thus facilitate connection with the waste heat passage N. After the excess of heat has been absorbed by the lining, in zig-zag form, of the heat regenerator I, the used gas is conveyed to the chimney through the flue N. The various positions of the dampers are reversed, and thereby the direction of movement with each change of current, which takes place at intervals of about thirty minutes. An intake corresponding to a horizontal flow is assured in the heat regenerators by the resistance of the dividing walls combined with the pressure; and, by suitably selecting the intake points for gas and air, uniform distribution of the combustible gas to be heated, over the entire height of the heat regenerator, can be perfectly regulated.

The two retorts A^1, side by side, shown in figs. 3 and 4, are surrounded by the heat flues F^1, each of which is branched in front with the heat regenerators H^1 I^1 by nozzle-shaped connections. The system of working is such that for one phase the heat regenerators H^1 receive gas and air at the extremities, while the two intermediate regenerators I^1 convey away the waste heat. With a change of direction, which occurs at the end of about thirty minutes, the current of combustible gas is reversed, so that the two intermediate regenerators receive gas and air, while the four outer ones H^1 store up the waste heat. Distribution of the fuel gas can be sufficiently regulated by the dampers S, worked from outside according to requirements, as ascertained by looking through the sight-holes T.

The various regenerators are vertically divided into separate compartments by walls U, and each of these compartments communicates directly with two heat flues H^1 or I^1. The intake of the various regenerators can be regulated as required, by acting on the distributing compartments, where the gas or air enters through orifices, by means of dampers such as the rotary dampers L^1 M^1. Thus heating can be regulated in such a way that the middle zone, for example, where the coke is formed, will be more highly heated. Regulation of the combustible gas before its entrance into the heat regenerators—*i.e.*, before it is heated—is of special importance; just as waste heat passing out must not be discharged until it has given off the main part of its excess of heat. At this point, however, the temperature is relatively low in both cases, so that regulation can be effected simply and surely; while the fundamental diffusion thus established in the heat regenerators is completely preserved. Moreover, in this form of structure, the lateral boundary-line of the chamber is more inclined at the top than at the base, to correspond with the greater expansion of the lining at the upper part due to greater heating there. Consequently the lining need not be fixed.

Progress in Carbonization.

The writer of the article on "Gas Engineering" in the Engineering Supplement to "The Times" last Wednesday, which contained the annual review, made the following remarks on progress in carbonization: "Year after year the gas engineer manages to find that he has neglected in the past to develop fully the resources of the coal he uses. Hence the efficiency of the process of carbonization appears to know no limits. Increasing yields per ton of coal of the principal product (gas) are the common story of the past year; while remarkable figures have been obtained as a result of a series of experiments carried out by the Gaslight and Coke Company, which showed that (under conditions hardly yet possible on a large scale) a ton of Durham coal is capable of yielding no less than 15,840 cubic feet of gas of 12 candles and 530 B.Th.U. calorific power. To-day an average yield of 13,000 cubic feet of gas per ton of coal is by no means uncommon; but at the present rate of progress even this should have faded into comparative insignificance before the expiration of another twelve months. Not only, however, can progress in gas yields be pointed to; but, owing to the increased economy accruing from modern furnace methods, the amount of fuel required for the distillation of coal is undergoing reduction, with the result that an additional quantity of coke is now available for the market."

Manchester and District Junior Gas Association.—We learn from the Hon. Secretary (Mr. James Bridge, of Stretford) that arrangements have been made for the members to visit the Stuart Street electric power station of the Manchester Corporation next Saturday. At the close of the inspection they will take tea together, and afterwards Mr. G. H. Haynes, of Liverpool, will read a paper entitled "Notes on Electricity in Gas-Works."

WORKS TOPICS—XVIII.

By "Modus Operandi."

A perusal of the newly-published transactions of the District Associations of Gas Engineers and Managers for the year 1913 shows that of the eleven Presidential Addresses delivered during the year some at least deal with problems of great interest to the works engineer.

Very often hints of a valuable nature are contained in these addresses; and unless one has an exceedingly clear memory the information is not forthcoming when most wanted, owing to the absence of an index giving details of their contents.

Of those in question, the two by Mr. H. O. Carr and Mr. W. S. Morland respectively will well repay a second reading by the technical works engineer. This also applies to a certain extent to the address by Mr. H. D. Madden. The remainder discussed principally questions of administration and distribution. It is noteworthy that the two first-named gentlemen are the engineers of two very successful Companies supplying in each case gas at the low price of 1s. 9d. per 1000 cubic feet. So that from this point of view their opinions and methods are well worthy of a close study.

Coal Handling.

To deal first with a few points mentioned by Mr. Morland. His coal-handling arrangements at Gloucester must be extremely efficient, for we are told that the cost of labour in handling coal is only about 3-10ths of a penny per ton delivered into the retort-house hoppers. By a judicious arrangement, it is possible to store four days' supply of coal directly over the retort-house elevator. A really substantial storage of coal in the right place for cheap handling is a great asset in any works, and is always well justified as an investment.

Mr. Morland makes it very plain that it is sound practice to use, as far as possible, the coal as it arrives, and to keep the emergency stores untouched from year to year. He states that at the time of the coal strike some had been in store for twenty years, yet when used he found that it had not depreciated by more than 10 per cent. The alternative practice of clearing all stores periodically is unsound, in that the repeated depreciation of the fresh-wrought coal, together with the extra cost of handling, is likely to lead to considerable loss.

Brick-Built Retorts.

It is clear that Mr. Morland is a great believer in brick retorts, which are also favoured by a number of other successful engineers. These retorts may be very suitable for six and even eight hour charges; but I doubt very much whether they would be satisfactory for use in works where heavy charges of 12 hours' duration have been adopted. In these cases a good deal of strain is put upon the retort in expelling the charge, and, as a consequence, any built-up retort is likely to suffer considerably. As a matter of fact, it is worthy of mention in this connection that in the discussion on a paper read before the Eastern Counties Association by Mr. Goulden a question was asked as to whether brick or moulded retorts had been used in the latest house at Beckton. Mr. Goulden in his reply stated that while he recognized that the life of a brick retort was far longer than that of the moulded retort, yet experience showed that with powerful machines striking against the interior surface of the retort it is impossible to keep a brick-built retort tight for any lengthy period of time. The question, therefore, of dispensing with moulded in favour of brick retorts is one that needs a good deal of careful consideration, especially in large works.

In this address, a very good hint is given with regard to the fire-clay jointing material used in building the retort-settings. To prevent settling-down and shrinkage of the setting—a common fault—Mr. Morland has for many years made a practice of grinding up old fire-bricks in a mortar mill. This is then carefully sifted and used in the proportion of two of ground fire-brick to one of new fire-clay. This practice is well worthy of adoption in other works.

Hydraulic Seals or Anti-Dips.

The question of using hydraulic or dry mains is one that can with advantage be reconsidered in the light of modern horizontal retort practice. The heavy charge results in a light tar, which, in properly arranged hydraulic mains, gives no trouble at all. Would there be any difficulty with dry mains in use? I am inclined to think that they would be quite successful, provided that due regard was paid to the details of the arrangements. In this connection, it would be advisable to maintain a level of liquor in the mains extending to a point just below the dip-pipes. This liquor should be regularly flushed-out and the hydraulics kept in direct connection with tar towers, so that the tar that condenses in the boxes can flow away immediately to the towers. Cort's anti-dip valve would lend itself admirably to this arrangement; and there are several others which would undoubtedly give satisfaction. The advantage of an unsealed dip-pipe is that a perfectly regular pressure can be maintained in the retort, irrespective of the quantity of gas that is being evolved. With a hydraulic seal it is inevitable that at the very time when there should be the minimum amount of pressure on the retort there is, in practice, the maximum—that is to say, when the retort has just been filled; while during the latter part of the charge, when there should be the maximum pressure, there is in reality the minimum. This is, of course, a very great disadvantage of the hydraulic seal. It causes loss of the best gas, and offers no check to the passage of the worst. It is obvious that when 12 cwt. of coal have just been charged into a retort a very considerable production of gas, extending over several hours, must result in maintaining in the retort a higher pressure than is desired—this being due to the impossibility of expelling the gas through the dip-pipes as quickly as it is being evolved. Though this may only result in the retort pressure being raised to (say) 1 inch for an hour or so, yet this is nearly an inch more than one would wish to have at such a time when the quality of the gas would be, perhaps, 20 candles or more.

Mr. Morland describes clearly why and how he dispensed with his hydraulic seals in favour of anti-dips. As the arrangement is undoubtedly a good one, his remarks should be re-read by all who are interested in making more gas per ton of coal. I should be much obliged if Mr. Morland would give a description of the throttle-valve, and also describe his method of running-off the tar that condenses in the hydraulics.

Wear and Tear.

It is particularly noteworthy that the average wear and tear at Gloucester over a period of 15 years has only been 1·84d. per 1000 cubic feet of gas made. This is, of course, exceedingly low. In fact, a great many undertakings would be gratified could they reduce their own corresponding figure to one double as high. Other matters of interest mentioned were that for hot coke, trucks constructed of plates were preferable to those of bars, while, as regards plates, those of iron were much better than those of steel. Experience of 31 years had also proved the success of the steam-jet exhauster at Gloucester, of which apparatus Mr. Morland spoke in high terms of praise.

Stop-ends to Retorts.

The only point in the address which, in my opinion, is open to criticism is that relating to the working of stop-ended retorts in preference to "throughs," which are, practically speaking, in general use in all works of moderate or large size. Having had some years' experience of horizontals which have given no trouble whatever, so far as stopped pipes and pitched hydraulics are concerned, I cannot think of the adoption of stop-ends except as a very undesirable remedy for such troubles.

[So much space has been absorbed in commenting on Mr. Morland's interesting address that I must postpone until next week discussing the questions raised by Mr. Carr and Mr. Madden.]

GAS AND OIL ENGINES.*

This work forms one of the "Broadway" series of engineering handbooks, and is a concise account of the most important types of gas and oil engines.

Chapter I. is introductory, explaining the action of the indicator in showing the inner workings of an internal combustion engine. There are also discussed the changes in the condition of gases under different degrees of heat pressure and volume; while some attention is devoted to the thermal and mechanical efficiencies of engines. Chapter II. treats shortly of coal gas as a source of power; while Chapter III. is historical, in that it describes the Lenoir and the Otto atmospheric gas-engines. Chapter IV. is devoted to the four-cycle and two-cycle engines; but it is easy to see that the author has had difficulty to give proper consideration to the subject in the limited amount of space at his disposal. This is, in fact, very noticeable throughout the book. In a very brief chapter (V.), consisting of only two pages, the new Otto engine is described.

"General Construction and Erection of Gas-Engines," as Chapter VI. is entitled, is misleading, as it does not treat of "Erection" in the engineering acceptance of the term. It discusses merely the construction and general arrangement of an engine with its various accessories. Chapter VII., on "Valve Gear, Ignition, and Governors," describes the usual practice in this direction. The explanatory illustrations relative to the letter-press in connection with valve gear and ignition devices are disappointing—being small and difficult to follow in detail, while the same reference letter does not indicate the corresponding detail in all the illustrations. The remarks in the second paragraph on p. 38 should be re-written; for they do not make it clear why the flame from a tube igniter is not drawn into the interior of the gas-engine cylinder until the dead-point is reached.

Starters for gas-engines are briefly referred to in Chapter VIII.; while a description of engines driven by liquid fuels follows in the next chapter. It is a pity that Mr. Salter, in translating the publication into English, did not use the English nomenclature for oils and spirits. Particularly noticeable is the absurdly small size of the illustration of the Otto petroleum engine, with the result that the details referred to in the text are anything but clear. The statement, too, that all oil-engines are of the four-cycle type requires qualification.

"The Diesel engine" is the title of Chapter X., in which the

* "Gas and Oil Engines." By Alfred Kirschke. Translated from the German and Adapted to English Practice by Charles Salter. London: Scott, Greenwood, and Son 1912.

important points of this type of engine are well put before the reader. Here again, unfortunately, the reference letters on the front elevation of the sectional illustration of the engine do not agree with those on the side elevation; moreover, the reference letters in the text do not agree as they should with those in the illustrations. It would be a decided advantage had these sectional illustrations been reproduced on a larger scale. Necessarily a handbook is brief in description; hence the need of clear illustrations.

Gas-producer plants, blast-furnace gas, and other waste gases are adequately treated in Chapters XI. and XII. Chapter XIII., on "High-Power Gas-Engines," is clear; the illustrations being good. A brief comparison of the working costs of gas, oil, and steam engines is given under Chapter XIV.; while Chapter XV. sums up the respective advantages and disadvantages of these engines. The concluding chapter deals with the prospects of the gas-turbine, and draws attention to some of the constructional difficulties which will have to be overcome before it will be as practical a success as the steam-turbine.

We notice two printer's errors—viz., p. 21, in the fourth line of the last paragraph "about" should be "above;" while on p. 120 the Nurnberg engine is described as "two" cycle. This should be "four" cycle.

Having pointed out briefly the contents of the book, reference should be made to a subject which closely concerns the gas engineer. This is the slighting manner in which town's gas is too often referred to in books on the gas-engine, especially by foreign authors. At the risk of unduly prolonging the review of this modest little book, a few points in this connection may well be mentioned. On p. 128, one sentence is particularly noteworthy. It reads: "The coal-gas engine is practically excluded, owing to the high cost of the fuel (see table, p. 125)." On turning to this table, which is included in Chapter XIV., on "Working Costs," it is seen that the table is entitled "Consumption and Cost of Fuel in Explosion Engines." Here coal gas is taken at 3¾d. to 5¾d. per 100 cubic feet; anthracite at 18s. to 30s. per ton; and coke at 15s. to 25s. per ton. Thus coal gas is compared on the very high basis of 3s. 1d. to 4s. 9d. per 1000 cubic feet. This may be correct so far as Germany is concerned, but it is at least twice as high as it should be on an English basis. We have every reason to quarrel with the so-called "adaptation to English practice" by Charles Salter, for it is clear that these figures have not been adapted to English practice. Had they been, a fair average figure for London and the Provinces would have been 1s. 9d. per 1000 cubic feet for gas used for power purposes; while in quite a number of Northern towns the price is much under 1s. 6d.—the lowest being at Sheffield and Widnes, where it is about 10d.

Considering that these books are put into the hands of students and the future engineers of this country, it is bound to have a prejudicial effect on the use of town's gas for use in gas-engines. Seeing that in London alone, where the price of gas for power is not so low as in the North, there must be in use not far short of 10,000 engines driven by town's gas, it is far from correct for a handbook published in this country to contain sentences such as the following: "The expensive coal gas is only used in rare instances as a source of motive power for large engines;" "coal gas is too expensive as a motive power for large engines."

It is not clear where the small engine ends and the large one begins; but in a country such as this, where gas for power is cheap, it is far from right for this important use of town's gas to be referred to in such a way in a handbook devoted to the subject. We have before had occasion to criticize books on the same subject by foreign writers. It is quite clear that the translations of such publications should be undertaken by, or at least under the supervision of, a competent English engineer. We should not then have occasion to refer to these gross inaccuracies in comparative costs and untrue expressions of opinion.

STUDIES IN WATER SUPPLY.

In view of his position as the Director of Water Examination to the Metropolitan Water Board, Dr. A. C. Houston is specially qualified to undertake the production of a book on water supply. This he was requested to do by the Editor of Messrs. Macmillan's "Science Monographs" (Professor R. A. Gregory); and the result is the recent appearance of a work which bears the title at the head of this article.* The author had for several years been urged to write a text-book on this subject; but he had been unable to find time to do so—the task being regarded by him as a very formidable one. When, however, it was pointed out that all that was required in the present instance was an account of his personal experiences and investigations, he felt that the case was different. This did not involve an exhaustive review of other men's work, but only, as he explains in his preface, the gathering together in one volume of an epitome of his own researches, the results of which are necessarily scattered through a considerable number of reports and papers. Since Dr. Houston was placed in charge of the Water Examination Department of the Metropolitan Water Board, he has issued from time to time, as "Journal" readers may remember, reports which have furnished abundant evidence of the exhaustive nature of his researches. Never before had the water supply of London been the subject of such minute investigation; and the author pays a high tribute to the "pioneer work" of the Board in instituting an elaborate system of water examination, by doing which they have, he says, looked at the whole subject of the water supply from an imperial point of view, and shown themselves fully alive to their serious responsibilities.

The contents of Dr. Houston's monograph may be epitomized rather than criticized. He naturally deals first with the three main sources of water supply—viz., upland gathering-grounds, underground sources, and rivers. With regard to the last, he points out that though the great bulk of the water supplied to London is drawn from the Thames and Lea, both of which rivers are admittedly polluted by sewage, the general health of the Metropolis has for long been "a source of pride to Londoners, and almost of wonder to the world." This fact surely testifies to the excellence of the existing purifying arrangements. The author discusses the value of the two rivers named as sources of water supply, and gives a number of chemical and bacteriological results corroborating and measuring the known or suspected facts as regards sewage and other undesirable pollutions. In face of them, he says, no man of science could support the continued use of the water of these rivers, in the absence of further information tending to free them from the full gravity of the charge of being sewage polluted, and of evidence that the purification processes in actual operation are uniformly efficient. With regard to the first point, it forms the text of the second chapter in the book, in which is given an account of researches tending to justify the use of rivers as sources of water supply. As to the second point, nearly the whole of the monograph deals with what the author describes as the "remarkable transformation of an impure raw river water actually into water of good quality," and not only this, but, when considered in relation to its origin, into one of "remarkable purity."

Having furnished his readers with some information in regard to the inherent and adventitious quality of river water, as illustrated by the Thames and Lea, the author proceeds to deal with the question of abstraction, and to show the effects of different methods on colour results. He next takes up supplementary processes of purification; a chapter being devoted to sterilization, with special reference to "excess lime" methods. Readers of the "Journal" who are concerned with water supply are aware that Dr. Houston is a great believer in the value of storage in connection with purification; and to this subject he devotes his sixth chapter. The processes which make for the purification of water under storage conditions are sedimentation, equalization, and devitalization. Formerly sedimentation was regarded as the chief factor of consequence; and Dr. Houston shows that it is still important. Even less than 24 hours' settlement has considerable purifying effect. Equalization has never, in his opinion, received the attention it deserves. Devitalization is a factor of supreme, if not paramount, importance. He says that unquestionably the destruction of the microbes of epidemic disease—*i.e.*, typhoid fever and cholera—in water is merely a question of time, though the exact time necessary for their deterioration and final disintegration is open to controversy. According to his experiments, "even one week's storage would result in a larger percentage reduction in the initial numbers of typhoid bacilli and cholera vibrios than we could ever hope to achieve by the use of sand filters alone, under the usual practical conditions of working." Generally speaking, provision for thirty days' real storage is considered by the author to be ample when dealing with sources of supply comparable with those of London.

The next subjects dealt with are water and disease and the financial value of a pure supply. In regard to the latter, the author says the facts, figures, formulæ, and inferences he has presented may be challenged and criticized, but he considers it impossible to gainsay the broad and general conclusion that, disregarding all humanitarian considerations, "the provision of a pure water supply is a sound financial proposition."

In his concluding chapters, Dr. Houston describes routine and special bacteriological methods, and gives some useful information bearing upon the subject dealt with in the book, including a list of the published reports of the Metropolitan Water Board and some of the chief reports on the Metropolitan Water Supply. The text is fully illustrated; and there is a fairly extended index to the book.

* "Studies in Water Supply." By A. C. Houston, D.Sc., M.B., C.M., Director of Water Examination to the Metropolitan Water Board. London: Macmillan and Co., Limited. [Price 5s. net.]

Thawing Gas-Mains.—The following appeared under the heading of "Wrinkles" in the "American Gas Institute News" for last month: "After determining where the main is frozen up, go to the nearest service or drip. Make a solid pipe connection from the service or drip, as the case may be, to an enclosed tank—one that will hold 40 gallons preferred. Place in this tank the amount of denatured alcohol that you think will be required, and make a steam connection from the boiler to the tank. The pipe that leads from the tank to the main should be taken off the top of the tank, and the pipe leading from the boiler should be carried to the bottom. This is done so that when the steam passes through the tank it will heat the alcohol, forming a gas which, due to the steam pressure, will be forced into the main. Do not open any valves or start operations until the pressure in the boiler exceeds the pressure in the main. This method of thawing can be used on low-pressure as well as high-pressure mains."

THE ECONOMIC ASPECT OF THE REPAIR AND MAINTENANCE SECTION OF A GAS-WORKS.

By F. R. Parsons.

Consequent upon the phenomenal growth in the direction of mechanical agencies in modern gas-works, an imperative demand has arisen for a considerable expansion in the facilities, both mechanical and human, wherewith to instal, maintain, and repair the various elements of machinery with which all modern works of any magnitude are now equipped. The solitary works fitter who at one time had little to do beyond repairing a cracked retort mouthpiece, fitting a new clack to the tar and liquor pump, or occasionally easing the brasses of the exhauster engines, now finds himself generally outclassed, and wholly incompetent to provide either brain or brawn wherewith to cope with the ever-invading tide of mechanical tendencies. He has been supplanted by a body of trained experts who, enlisted in many instances from the shops wherein such machinery has its creation, have at their finger ends all the expert knowledge necessary to maintain a reasonably unbroken continuity of mechanical conditions. The old fitting shop, which was tacked on to the exhauster house for convenience, and as a means of obtaining cheap power to run the solitary, out-of-date lathe, the antiquated drill-press, and the diminutive planer, is now venerated as a museum. In its place is a well-ventilated, generously lighted, and commodious machine shop, replete with what mechanical modernity spells as the top notch in point of labour-saving tools, devices, and equipment, and worked by a staff of trained mechanics, with a competent and practical chief at their head. That all this is very necessary to-day is beyond dispute. Jobs are now tackled inside the walls of a gas-works, work undertaken, in character both new and repair, which would have been altogether undreamed of thirty, twenty, or even fifteen years ago.

Now, the present writer has at one time and another paid brief visits to these particular sections of the gas industry, and he has invariably been struck with one dominating impression—they lack that systemized attention to economic detail which is the very life and soul of a shop run on competitive lines and engaged upon competitive work. Naturally we would expect this, the reader may say. Granted—up to a point. To the casual observer, a mechanic might be operating a machine tool or else handling a job at the bench with commendable satisfaction, and even with alacrity, and a mere hint that he was taking a walk all round a ten-acre field in order to get to the centre would be immediately repudiated, if not indignantly resented. But, to those whose training is that of the competitive, contract-hustling order, the methods too often employed in the direction indicated, together with the lack of economic supervision, are at times painfully obvious. The power service is neglected, because the productive element can be obtained at cost price, and is therefore regardlessly cheap; the power-distributing agencies do not bear the hall mark of economic forethought and care, for the reason that upkeep and maintenance are but very subsidiary, and sometimes wholly negligible, factors. The productivity of the shop is discounted by the absence of any incentive to cheapening of production, or a simplification of processes or operations. Now the present writer is very naturally and quite justifiably entitled to ask, Should the fact of the motive power being relatively cheap be an excuse for wasting it? Should the power-distributing agencies suffer inattention and consequent deterioration because those who are responsible depreciate, if not utterly ignore, the first and fundamental law of economics? And should the output be burdened with costs which ought never to be borne, when, with the exercising of a more discriminating and exacting element of supervision, the products of the shop would come out more on an equality with those upon which have been conferred the economic advantages of specialized brain and fingers? The first-named factor might be taken as having been exhaustively treated by the writer in a former article in the "Journal," in so far as it referred to the care, the management, and the efficient running of the prime mover—the gas-engine. The second will now be considered.

Undoubtedly the transmission of power is as important a factor as its generation, since it follows that distribution must be governed, and is wholly limited, by production. Now the actual efficiency of shafting as a power transmitter is represented by the amount of work which it is capable of performing when we have eliminated friction, due to the bearing points, torsional effort, weight, and air resistance due to the pulleys. But as all these factors, with the exception of the first named, are of the kind over which we have no control, it follows that, in order to obtain the highest degree of efficiency possible, all efforts in our search for economy must be brought to bear upon the former. Now, as it is an actual impossibility to reduce to an inappreciable quantity the frictional element involved, the best we can do is to endeavour to carry this reduction to a point which is practically permissible—in other words, to concentrate our efforts upon the position and nature of the bearing points. As the amount of friction set up in a bearing is in direct proportion to the area of bearing surface, having due regard to other determining factors (such as the weight carried by the bearing, and the number of revolutions of the shafting per minute), it again follows that, to reduce this friction to a practicable minimum, all remedial measures must be directed along lines which will tend to a reduction of the frictional area.

Now, the reverse of this is too often the case. The writer has seen both line and motion shafting bearings so utterly neglected that the motive power, ample enough for its duties under normal conditions, has altogether failed to run up to speed empty machines. The irony of it was that in this particular instance the bearings were of modern design, of the self-oiling type, in which regular lubrication was supposed to be effected by rings rotating around the shaft and carrying oil to it. In all justice to the makers, however, the fault did not appear to lie at their door; the fact of their being designated "self-oiling" being in a sense responsible. The bearings had been fixed close on three years, and, it transpired, never once during this period had they received a fresh supply of oil. When examined, it was found that the dust from the adjacent coal-store had worked its way into the oil-wells and so converted the oil into the consistency of glue. Can anyone form the vaguest estimate as to the extent this had eaten into the power charges during this period? Reverting to the reduction of friction. Power transmission economists are agreed that the reductional area can best be effected by adopting a form of roller-bearing; basing their arguments upon the generally accepted fact that, by the conversion of scrubbing or sliding friction of load-bearing surfaces into a pure rolling motion, the ratio is as twelve to one in favour of the latter.

Professor Goodman, of the Leeds University, is responsible for the following data, which were found in a series of tests conducted by him with a view to ascertain the factors of friction in connection with ordinary sliding or rubbing bearings as opposed to those of the rolling type. Relating to load where roller-bearings are concerned, he states that the friction per ton of load actually decreases as the load increases. Under a pressure of 1000 lbs. at 40 revolutions, the bearing friction was at the rate of 8·512 lbs. per ton of load; but under a pressure of 10,000 lbs. at the same speed the friction had decreased to 3·584 lbs. per ton of load. Then, as to speed, he says that this has very little effect upon the co-efficient of friction. In the case of a load of 1000 lbs., the co-efficient was constant between the speeds of 40 and 480 revolutions per minute; and in the case of a load of 10,000 lbs., it varied from 0·0016 at 40 revolutions to 0·0013 at 160 revolutions, and remained constant at this figure to 480 revolutions. Further tests proved that the slight friction to be overcome in starting shafting fitted with roller bearings was practically speaking the same as the running friction.

It would, however, be invidious in this article to select any one particular maker's claims as an example of what is possible to be effected in the matter of economy in this direction. But to generalize such statements and claims, it can safely be asserted that, by the adoption of roller bearings to all line and motion shafting, a saving in power of from 25 to 75 per cent. can as a rule be guaranteed. This, then, is a very important factor of economy to be considered when the gas-works engineer is contemplating the installing of running machinery or a machine tool plant.

Yet another factor of economy will bear investigation and consideration. It is as unwise as it is erroneous to conclude that efficient lubrication can be effected through the medium of cheap oil; and it is advisable to remember that, the higher the speed of moving mechanism, and the more delicate and intricate the movements attached thereto, the greater the need for the employment of a lubricant which shall allay all anxiety as to its efficiency in maintaining safe and uninterrupted conditions. It is an old saying and true that a drop of oil at the right moment is worth far more than a gallon at the wrong; and a teaspoonful divided into drops is more effective than the whole given at a dose. An eminent authority is responsible for the astounding assertion that a modern express locomotive will run a mile on three to four drops of oil properly applied. Another authority—an American—says that shafts running in self-adjusting bearings (the latter being four diameters long) at a speed of 120 revolutions per minute require on an average, and under ordinary conditions of service, 2·2 fluid ounces of oil per bearing every six months. Now, assuming that in one fluid ounce there are 480 drops, the total amount of oil to be fed to a bearing per day is $1056 \div 182 = 5{\cdot}8$ drops, or say six drops of oil per bearing per day. But in his continuing remarks thereon he reveals the secret of this apparently unbelievable proposition—it must be a continuous feed.

The usefulness of this example of careful research lies not in its strict application, but as an illustrative point, to drive home the truth that, unless an efficient system of lubrication be adopted, there is more oil wasted than is put to useful service. As a yet further illustration of the advantage of continuous, as opposed to intermittent, oiling, the writer is enabled to quote an extract from the record of a series of tests conducted by S. Webber, an authority on power transmission, on shafting in mills doing their every-day work. "Continuous oiling gave a co-efficient of friction of 0·044, while intermittent oiling gave a co-efficient of friction of 0·066." This conclusively proves that, if a shaft is lubricated at intervals, it takes 50 per cent. more power to drive it than if continuous lubrication be adopted. Now, if there is an inference to be deducted from this, it must be that it is a better, wiser, and more economical policy to pay a fair price for oil and use every drop with economy and judgment than to purchase the cheap article because it happens to be cheap enough to allow of appreciable waste.

Just a word now on another economic factor—tool steels. Except in very special cases, ordinary carbon steel for machine tools should be rigorously excluded from the machine shop, and relegated to the museum already referred to. There is very little excuse to-day for a machinist to grumble at the limited scope

afforded him in regard to a suitable selection of steels for his various operations, or that he can get nothing to stand the high speeds and the coarse feeds which modern machine-tool practice demands. Although it is not always possible or perhaps expedient to speed-up (say) a planer which was built before the high-speed steel era, in order to reach the safe maximum limit permissible as a result of the higher possibilities, yet in feed alone and duration of cutting edge, the writer has found it a decided and economic advantage to pay the extra cost incurred in having nothing but high-speed steel tools. Other machine tools, such as the lathe, shaper, milling, slotting, and drilling machines, and even boring and turning mills, present comparatively little difficulty in the matter of speeding-up to meet improved conditions. Hence full advantage can be taken of a steel's increased possibilities and higher potentialities.

For instance, it was considered good practice to run a carbon-steel twist drill at 35 feet per minute in steel, 40 feet per minute in cast iron, and 100 feet per minute in gun metal, with a feed per revolution from 0·005 to 0·015 inch. But to-day, thanks to high-speed steel, drills are run as high as 100 feet per minute in steel, 130 feet per minute in cast iron, and 160 to 180 feet per minute in gun metal and brass. So is it with a lathe. It is common enough to-day to see mild steel turnings leave the stock so high in temperature as to be positively dangerous to an operator, and in test jobs, undertaken with a view to determining the maximum speed limit, it is quite usual to see the steel shavings red-hot as they leave the tool. Of course, one is prepared to pay the extra cost incurred over that of ordinary carbon steel, knowing that higher efficiency and an increased productivity fully warrant the expenditure being made.

The writer deems no apology necessary for referring to an aspect of the steel question in relation to gas-works engineers and mechanics. The ordering of tool steels is usually delegated to the works engineer, who may or may not be conversant with a steel's good qualities or bad, its capabilities or its limits, or understand the treatment necessary to fit it for efficient service. To-day steels require varying and widely differing treatment to convert them into tools—this information being usually supplied by the makers, who, unless the instructions are rigidly adhered to, refuse to become responsible for a steel's performance. In every case this special information should be passed direct to the person actually in charge of the tool making, and not be withheld by an official who is either prone to think a workman will know too much, or that he himself does not understand it.

The writer remembers an incident bearing on the above in which some new steel came into the machine shop of a gas-works, unaccompanied by any particular instructions as to its treatment. By treating it on lines similar to that required by a previous lot of a different make, the quality of the tools turned out a poor third-rate; the steel as a consequence being condemned. The writer, happening to raise the topic of tool steels to the foreman in charge while on a business visit, was shown the lot in question, and had to listen to a string of choice epithets bestowed on it. Now it chanced that the writer knew and appreciated from practical experience the high value of this particular brand; consequently, it came as a surprise to learn that it was such "rotten stuff." Inquiring into the mode of treatment, it transpired that, owing to lack of definite information, the steel had been in every case spoilt in the fire during conversion. Inquiries in another direction elicited the information that the printed matter containing full and minute instructions concerning its treatment, together with the care and treatment to be observed in the hardening, had been passed over to the weighbridge clerk, who in turn had taken it home to his children, because it contained some pretty coloured pictures!

Having thus briefly touched upon some of the many factors of economy possible in the repair and maintainance section of a gas-works, it only remains for the writer to add that, in connection with the human factor involved therein, it would or should follow as a natural consequence that, given improved conditions in the directions indicated, the result would be a distinct and undoubted gain in this respect also, and would conduce to a more efficient and economic state—making for a permanent improvement in productivity, as well as a marked reduction in running and maintenance charges.

A Gas-Producer for Sawdust.—According to the "Ironmonger," the Campbell Gas-Engine Company, Limited, of Halifax, have supplied to the Swindon works of the Great Western Railway Company a novel form of gas-producer, consisting of an apparatus fed with sawdust, chippings, and other wood waste, instead of coal or coke. This plant provides gas for a Campbell four-cylinder gas-engine of 350 B.H.P., coupled to a dynamo. The producer is kept at a high temperature by the partial combustion of sawdust in a limited supply of air. The heat first liberates hydrocarbon gases and a little wood tar from the shavings; the limited supply of air admitted converting the remaining solid charcoal into gaseous carbon monoxide. This gas and the hydrogen and hydrocarbon gases in the final product are all combustible and suitable for use in internal-combustion engines. The wood refuse is fed automatically from under the machines, or wherever it may have collected, by means of a cyclone elevator into a loft constructed over the gas plant, whence it passes into a hopper connected with the producer.

BENZOL AS A MOTOR FUEL.

By G. E. Foxwell.

One of the most important, and at the same time, one of the most interesting, propositions before the scientific world just now is the question of finding an efficient substitute for petrol as a fuel for motors. Owing to the prevailing high price of petrol and the possibility of the exhaustion of the supplies at an early date, this search for an efficient substitute is rapidly becoming of the utmost importance.

Many fuels are being experimented with at the present time, among which may be mentioned benzol, alcohol, paraffin, and naphthalene. Of these, on purely theoretical grounds, such as specific gravity, volatility, heating power, and ease of adaptation to existing types of engine, benzol would appear to possess considerable advantages. A very large quantity of benzol is being used to-day in motors with, on the whole, very fairly satisfactory results. In some cases, however, difficulties are experienced in connection with its use—mainly on account of a deposit which forms in the cylinders and on the valve-seatings. That the formation of this deposit is by no means of common occurrence is shown by the fact that, in the majority of cases, no trouble is experienced from this source. The deposit may be due either to incomplete combustion of the fuel or to impurities.

With regard to the former, it may be mentioned that benzol is a compound consisting of hydrogen and carbon. If benzol is allowed to burn with excess of air, the products of combustion are carbon dioxide and water vapour. Should the air supply be insufficient, the products formed are carbon dioxide, water vapour, carbon monoxide, and carbon. The carbon is left as a sooty deposit on the valve-seatings, cylinder walls, and on the portion of the ignition device within the cylinder, giving rise to misfiring and other troubles. The remedy in this case is obvious. An additional supply of air must be admitted to the cylinder; and if this is not possible with existing arrangements, an extra air inlet must be provided. Fortunately, this is not a difficult matter. It is a well-known fact that benzol requires more air than an equal volume of petrol if the best results are to be obtained.

That this deposit trouble is only occasionally met with points to the fact that the impurities are not present because our system of refining is wrong, but because of carelessness on the part of the refiner. Experience has shown that the deposit may be removed by the injection into the cylinder of a little paraffin fairly frequently. Since paraffin is sometimes used as a motor spirit, it is clear that it will exert no harmful effect on the cylinder. One precaution is, however, necessary—namely, that after the injection of the paraffin the engine must be oiled thoroughly, as the paraffin will wash the lubricating oil from the cylinder walls, and a seize will follow.

To deal effectively with the deposit trouble, then, it is only necessary to admit more air for combustion, or, if this precaution is not effective—the deposit being due to impurities—to inject a little paraffin into the cylinder (say) after each fifty or one hundred miles run—not forgetting to oil-up afterwards. Recent research has shown, however, that this trouble is not met with if the benzol is properly refined; and so the best remedy is the adoption of more careful methods of purification. It is of comparatively infrequent occurrence, cars and motor cycles having, to the writer's knowledge, been run for long periods on benzol without the slightest inconvenience from this source.

In the early days of benzol, and to some extent at present, considerable trouble was caused by the sulphur it contained. On combustion this was oxidized to sulphur dioxide, which, in its turn, was oxidized to sulphuric acid. This attacked the valves and cylinder, causing corrosion. Careful refining, however, will reduce the sulphur content to a negligible quantity; and if the benzol is purchased from a reliable source, no trouble will be experienced from this cause.

One of the first essentials an efficient motor spirit must possess is that it must be volatile. Unless this point is secured, it will be impossible to start the engine when cold, and a special carburettor is necessary. Benzol for use in motors should be rectified, and of what is known as 90 per cent. strength—that is to say, at least 90 per cent. of the spirit as received from the distiller must vaporize at a temperature of below 100° C. (212° Fahr.). Benzol of this nature is only a very little less volatile than petrol, and it is quite easy to start the engine when cold on 90 per cent. benzol. Contrary to the oft-repeated statement, practical experience under ordinary working conditions has shown that no special carburettor is necessary.

Benzol is, however, not merely an efficient substitute for petrol. It has considerable advantages over the latter, both on the score of price and of efficiency. The price of petrol may be said to average 1s. 10d. a gallon. The older oilfields are showing signs of exhaustion, and those of more recent development yield a petroleum rich in heavy oils but poor in the lighter oils from which petrol is prepared. With the consequent diminution of the supply the price of petrol will certainly not drop; and since the demand for motor spirit is increasing, petrol will almost certainly continue to rise in price.

In the case of benzol, on the other hand, the supply is increasing by leaps and bounds. Benzol is a product of the destructive distillation of coal; and with the rapid displacement of bee-hive coke-ovens by ovens of the modern bye-product recovery type, it is clear that the output is continually increasing. The present

price of benzol is about 1s. 5d. a gallon; but in places where it is manufactured (such as South Yorkshire), it is procurable at 1s. 3d., and if such a step were found necessary further reductions could be made and still leave a clear profit.

On the score of efficiency, benzol is again superior. As a result of tests made by many different experimenters, under varying conditions, it has been shown that, volume for volume, 15 per cent. more mileage can be obtained from benzol than from an equal volume of petrol—one authority even puts the figure as high as 25 per cent. At first sight this would not seem possible, as petrol has a higher calorific value than benzol. One pound of benzol as used for motors has a heating value equivalent to approximately 17,780 B.Th.U., against 20,300 B.Th.U. in the case of petrol. Benzol, however, has a specific gravity of ·88, as compared with ·722 for petrol. Hence, 1 gallon of benzol weighs 8·8 lbs., while 1 gallon of petrol weighs only 7·22 lbs. This extra weight of fuel is more than sufficient to balance the deficiency in heating value.

Properly refined benzol, then, is at no disadvantage on any one point as compared with petrol, and actually gives a considerable increase of mileage at less cost. If any confirmation of the statement be required, it may be found in the fact that 50 per cent. of the benzol produced in this country is sent to Paris, where it is used for the omnibuses. Benzol is also used by the heavy motor vans owned by the various London Gas Companies, and by similar vehicles in many of our large towns, besides by hundreds of private cars and cycles up and down the country with, in nearly every case, excellent results.

GASEOUS COMBUSTION.

Lecture by Mr. L. F. Tooth.

A gratifying audience assembled at the Westminster Technical Institute, Vincent Square, S.W., on Friday evening, to hear the first of a series of three lectures on "Gaseous Combustion," arranged by the Council of the London and Southern District Junior Gas Association in conjunction with the London County Council. The lectures are being delivered by Mr. L. F. Tooth (of the Commercial Gas Company), whose practical work in connection with the use of gas in industrial operations is well known.

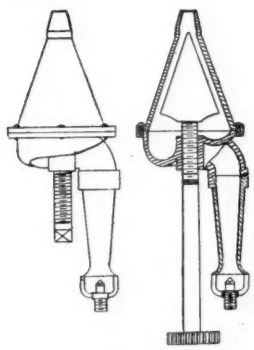
In his opening remarks, the lecturer voiced his conviction that gaseous heating has an enormous future, and offers to those connected with the gas industry a vast field for research and thought. But apart from the impetus given to the gas industry, it has many sides, and will play its part in furthering the present-day objects of all industries—namely, the necessity for manufacturing under more scientific and accurate conditions; the study of health conditions in factories; and the elimination of sulphur and abatement of smoke. His view is that in the near future the adoption of gas and oil will entirely supersede the use of coal and other solid fuels for heat and power purposes. Referring to the long period taken in developing to a commercial degree the use of gas for furnace heating, he acknowledged the great amount of pioneer work done by the late Mr. Thomas Fletcher, the lines laid down by whom were subsequently followed by many others.

Among the many reasons for the comparatively slow progress made by gaseous heating, Mr. Tooth pointed out that the industries of this country are generally loth to adopt new ideas. Manufacturers of gas apparatus for furnace work, too, must of necessity look to the profitable side of their product; and though they have done much in the way of development, it could not be expected that they should provide the necessary funds for continual research, these requirements being greatly in excess of their reward upon the sale of the manufactured article. Then gas undertakings have increased their consumption to an enormous extent by the introduction of cooking and heating stoves, prepayment supplies, &c., and thus had all the business they could conveniently cope with, which also may be responsible for the overlooking of research to develop the new field of use. That the industrial use of gas as a fuel has for many years past remained in a somewhat dormant condition in comparison with solid fuel, producer gas, and oil, is due, further, to designers having overlooked the fact that a relatively smaller space is required for the combustion of a given volume of gas, and to the building of furnaces of bulky brickwork, with combustion chambers and flues far in excess of what is required—this being responsible for low efficiency, due to excessive space for combustion, high flue temperature, and loss by heating heavy brickwork. An error on the side of excess can be easily understood, when one pictures the vast amount of space required by a solid fuel fired furnace, as compared with one fired by gas, to carry out certain work.

The use of high-pressure gas in industry was next touched upon; appreciative acknowledgment being made of the work in this direction carried out by the late Mr. A. W. Onslow, Mr. E. W. Smith, and Professor Bone. The lecturer then went on to deal with one of the most important features of gas-heated furnaces—the burner. Furnace burners, he said, may be divided into three classes—low pressure, high pressure, and air pressure. The first-named type are generally used for low-temperature work, and have hitherto been considered a preferable form of heating for annealing furnaces in which soaking or continual saturated heating is required. The second have been confined more generally to high-temperature work, though they are equally suitable for fairly low temperatures, with greater economy, providing the construction of the furnace permits of distributing the heat equally. Air-pressure burners have been used more in connection with metal melting where high temperatures are necessary, and also to a fair extent for large annealing, plate bending, and open hearth furnaces. The high-pressure burner has a very wide range to govern the flame temperature by the operation of pressure. Of even greater importance than the type of burner selected, however, is the securing of simplicity in operating; for nothing will be condemned more readily by workmen than a furnace that involves intricate adjustments in order to maintain a constant, or obtain a varying, temperature.

Considering this aspect further, he said that with air-pressure burners more attention is demanded on the part of the operator than with high-pressure gas. Adjustments of both gas and air require to be made from time to time which are difficult in a closed melting furnace or a muffle where a series of burners are firing under the bed. Excess of air not only means loss of efficiency, but has a deleterious effect upon the brickwork. In the case of melting furnaces, such excess readily scales, and eventually cracks, plumbago crucibles; and it also oxidizes certain classes of metal that may be under treatment. At high temperatures an excess of air gives the brickwork the appearance of a sponge, at a spot where the burner may impinge. With high-pressure burners, on the other hand, control is easier; as the primary air supply to the burners is, for all practical purposes, automatically controlled within certain ranges by the pressure of gas. For instance, a burner that is normally working at 2 lbs. pressure would not need alteration to the air-sleeve or air-valve if the pressure were increased to 4 lbs.; subsequent ranges being 4 lbs. to 7 lbs., 7 lbs. to 10 lbs., 10 lbs. to 15 lbs., and 15 lbs. to 20 lbs. For this regulation of temperature by means of pressure, it is necessary to leave an open space around the nozzle of the burner. Then when the pressure is increased (say) from 7 lbs. to 10 lbs., the additional secondary air required is drawn into the furnace around the burner-nozzle by the increased velocity of the flame. The increased velocity of the combustible mixture would tend to slightly increase the flue suction, though not necessarily increasing the flue temperature, as combustion would take place more rapidly by reason of the condensed volume of flame. In high-pressure furnaces, it is possible to work with a flue suction of less than half-an-inch, while the gaseous mixture may be entering at a pressure of 10 lbs. or over. The open space round the burner-nozzle also serves another useful purpose, inasmuch as it provides a sight-hole for recording temperatures and taking other observations. With "sealed" burners (entering the furnace without an opening being left round the nozzle), which is the usual method of fitting air-pressure burners, observations of working can only be taken by opening the furnace-doors.

After explaining, by the aid of the blackboard, how control of pressure can be secured with a steam throttle-valve, working in conjunction with an ordinary pressure-gauge, Mr. Tooth proceeded to deal with the construction of burners; and then he illustrated, by lantern slides, various types of burners, and indicated the purposes to which they have been applied. He expressed the opinion that for blow-pipe purposes, and where the flame is visible for working, the control of air has the advantage of high-pressure gas. There are some high-pressure blow-pipes on the market; but he thinks there is a good deal of work yet to be done before air pressure will have a rival for brazing purposes, delicate glass work, or other classes of work where the flame is applied without brickwork or furnace enclosure.



Tooth's "Snail" Burner.

Mr. Tooth showed photographs and specimens, and briefly described, different high-pressure gas-furnace burners which he has invented. Among these may be mentioned the "Six-Tube" burner, constructed to pass large volumes of gas up to 2000 cubic feet per hour. It consists of a gas-box, with a number of injectors to correspond with the number of bunsens. The bunsens are connected into one chamber, which is fitted with a central tube to supply air internally to the flame, to assist secondary combustion. There are special air-supply control arrangements; and the burner is quiet in action, and is fitted into a furnace with an open space around the outside of the nozzle. Air is thus supplied internally and externally around a ring of flame. A modi-

fication of this is the "Triplex" burner, in which, however, there is no central air supply—this being unnecessary owing to the smaller volume of gas involved. These burners are used principally in connection with high-pressure gas metal-melting furnaces. The two types of "Snail" burner are designed to allow the single bunsen tube to enter the chamber, and the gaseous mixture to travel spirally along a helical path—thus making it issue into the chamber without any possible interference with the incoming stream. The range of control is wide; the burner being capable of taking excess primary air and a corresponding increase in secondary air due to the high flame velocity. The other type is similar, except that the bunsen tube is vertical, and the gaseous mixture enters the helical path by a bend or elbow. The "Two-Ring" burners are suitable for open-fired furnaces, boiling-pans, &c. There are two bunsen tubes; and the inlets to the ring are so arranged that the two streams of gaseous mixture do not intermingle.

In bringing his first lecture to a conclusion, Mr. Tooth confessed that he does not know that any absolutely definite rule can yet be generally accepted for the sizes and lengths of flues and the amount of space required for the combustion of a given volume of gas, in accordance with the pressure or force at which the gaseous mixture enters. That the matter is a highly important one, he demonstrated by diagrams thrown upon the screen.

USE OF POWER IN FACTORIES.

A paper was read before the Manchester Association of Engineers, last Saturday week, by Mr. EDWARD G. HILLER, the Chief Engineer of the National Boiler and General Insurance Company, on "Power Production in the United Kingdom." The present position of mechanical power production for factories and workshops was reviewed, and a sketch was given of the stages of development leading up to the existing condition of the power producing industry.

In the course of the paper, the author said that the use of steam for small independent units of power was probably decreasing, particularly where a gas or electric supply was available; but in the larger factories there was a general advance in the economical use of coal. It should be remembered that large economies could not come at once. Old plants must generally work out their time before replacement. A comparison of the cost of modern plant with old plant seldom showed that the savings of the modern plant were sufficiently great to justify the pulling out of an old plant in good condition. In estimating the total power of different prime movers, he pointed out that reciprocating steam-engines in 1907 produced about nine-tenths of the power—namely, 9,118,818 H.P. out of a total of 10,578,475 H.P. The steam-turbines installed at that time were of a capacity equal to 530,892 H.P.; and the bulk of them were in works included under the heading of "Public Utility Service"—mainly electric supply undertakings. Internal combustion engines, including both oil and gas, accounted for a total of 680,177 H.P. These engines were chiefly used by the iron, steel, engineering, and shipbuilding trades; and no doubt large gas-engines using blast-furnace gas constituted a great proportion of this power. Apparently in the iron and steel and similar trades the total power capacity of internal-combustion engines was about 10 per cent. of the steam-engine power capacity in these trades. The water power represented about 1 per cent. of the total power capacity.

The fuel cost of different engines was the subject of a table. The steam-engine and boiler (with superheater) showed a fuel cost of 0·137d. per B.H.P. hour for 250-I.H.P. plants and of 0·123d. for 1000-I.H.P. plants. The figures in the case of the steam-turbine were 0·111d. for 1000-I.H.P. plants, 0·102d. for 2000-I.H.P. plants, and 0·100d. for 5000-I.H.P. plants. In the case of a gas-engine, the fuel cost per B.H.P. on town's gas (calorific value, 600 B.Th.U.) was given as 0·313d.; on suction gas (anthracite coal), 0·193d.; and on bituminous producer gas, 0·084d. The figure for Diesel engines of 120 B.H.P. and upwards was 0·212d. In these computations, the following conditions were postulated: In the case of steam-engines, an evaporation of 7½ lbs. of water per pound of coal at 13s.; the mechanical efficiency of the engine being taken at 90 per cent. With regard to turbines, the evaporation and the price of coal were taken to be those mentioned for steam-engines; while the steam consumption figures were those given in a paper by Baumann read before the Institute of Electrical Engineers in 1911, and the efficiency of the generator was assumed to be 94 per cent. In the case of gas-engines, the cost of gas was taken at 1s. 9d. per 1000 cubic feet (the Manchester price); and the figures quoted applied to engines of about 50-B.H.P. Anthracite coal for suction gas production was taken at 36s. a ton; and slack coal for bituminous producers at 12s. a ton—in this case the fuel including stand-by losses. With regard to Diesel engines, the price of oil was taken at £4 10s. a ton.

In a table indicating the reliability of different types of engines, the number of breakdowns, taking the steam-engine as 1, was shown as follows: In the case of steam-turbines, 3·36; gas-engines up to 14 inches, 0·6; gas-engines from 15 to 24 inches, 2·82; and Diesel engines, 3. Another column gave figures for the number of breakdowns multiplied by the cost per breakdown—again taking the steam-engine as 1. Steam-turbines, 6·3; gas-engines up to 14 inches, 0·24; gas-engines from 15 to 24 inches, 3·01; and Diesel engines, 3·75. A survey of these figures, the author said, indicated that steam-engines in respect of liability stood at the head of prime movers for comparatively large powers. The small gas-engine up to 14 inches diameter showed even better results than steam-engines of all sizes; but the larger gas-engines, on the other hand, by their higher figures of the number of breakdowns and cost, showed a substantially lower degree of reliability.

The reading of the paper was followed by a discussion.

POWER FROM COLLIERY WASTE FUEL.

At the Meeting of the Midland Institute of Mining, Civil, and Mechanical Engineers, held in the Sheffield University last Tuesday, two papers were read which dealt with the question of utilizing the waste fuel of collieries for the production of power.

The first paper was by Mr. A. T. Cocking, the General Manager of Messrs. Kynochs, Limited; its title being "Modern Gas-Engine Practice for Collieries." In the course of it the author said the possibility of generating gas from waste fuel purposely left in the mine, or picked out as useless in sorting the coal, must now be recognized as a means of supplying most, if not all, the power required for the work of a colliery. This source of power, added to that recoverable by utilizing the gases generated in coking coal, points to the probability that in the near future a modern colliery will be in a position not only to generate its own power without using its saleable fuel, but will also from the same source supply electrical current to neighbouring factories for power, or to townships for light. Taking into consideration the unique advantages which a colliery possesses in having its saleable fuel at first cost, it is not an extravagant prediction, in the author's opinion, to say that in the future, by means of a judicious blending of the cheaper kinds of its saleable fuel with its available waste, and by the full use of the products of its coking plant, an up-to-date colliery will become a great power-generating centre, the revenue from which will be the predominating factor in its profits. In a comparison of the relative costs of power generated by gas-engines and steam-engines, the author estimated that, at a colliery using (say) 3000 H.P., probably 5 tons of coal per hour (or 36,000 tons per annum) would be burnt in Lancashire boilers to raise its steam; and at a value which may be taken at 5s. per ton (for the sake of fixing a value) this would represent in a year £9000 in fuel. Allowing 1 lb. of the same fuel for each H.P. hour in a gas-power plant, the consumption would be 1·34 tons per hour, or 9643 tons per annum, the value of which at the same rate would be £2410; thus effecting a saving of £6600 by using only 26·3 per cent. of the fuel used in the old way. A set-off against this cost of fuel would be the profit on the 300 tons per annum of ammonium sulphate which could be recovered from it.

Mr. T. C. Wild, of the National Gas-Engine Company, dealing with the subject of the development of the gas-engine in England and its adaptation to the generation of power at collieries and iron-works, said it was only within the last ten years that the prejudice which formerly made the British colliery-owner reluctant to erect bye-product coke-ovens, and the British ironmaster to make use of coke produced in them, has been overcome, and in the same way the application of surplus gas for power had not advanced in this country as it had on the Continent and in America. In the matter of reliability, the gas-engine was proved to hold its own; the percentages of breakdowns being, in the case of steam-engines, one in 8·1, in electric engines one in 8·2, and in gas and oil engines one in 12·4. Mr. Wild described a number of large installations the experience of which, he maintained, proved that collieries which have bye-product coke-ovens possess in the surplus gas a source of power which may enable them to reduce their colliery consumption very materially; that a considerable quantity of refuse material now tipped to waste can be utilized in gas-producers, either in cases where there are no bye-product coke-ovens, or where the material is unsuitable for coking; and that modern gas-engines are now as reliable as, and much more economical than, steam-engines.

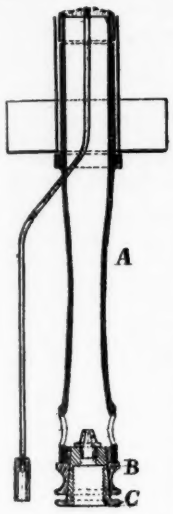
The Birmingham Gas Committee recommend that an increase of £100 per annum, as from Jan. 1 last, be made in the salaries of the Engineers of their three largest works. The present salary of both Mr. John Foster, of Windsor Street, and Mr. W. Chaney, of Saltley, is £800 a year, and that of Dr. W. B. Davidson, of Nechells, is £700.

The Midland Junior Gas Association have arranged for their annual dinner to take place at the Great Western Hotel, Birmingham, on the 14th inst. The evening will be both profitable and enjoyable; for, in addition to an address by Mr. F. J. Bywater (the Engineer of the East Greenwich station of the South Metropolitan Gas Company), who was the first President of the Association, there will be a musical programme.

In last week's "JOURNAL" we notified the death of Mr. Joseph Jervis, but by inadvertence he was described as Manager of the Eckington Collieries. As a matter of fact, up to the year of 1907 he was Secretary of the Company, which office he had held for more than thirty years. Mr. Jervis's total connection with the Company was for a period of sixty-five years. He died at his house, "Danesbalk," Eckington, near Chesterfield.

NEW KERN BURNERS.

The Société Française de Chaleur et Lumière has lately produced a series of Kern burners specially designed for public lighting. Their principal feature is the arrangement for the adaptation of pilot-jets and automatic lighters. As shown by the accompanying diagram, the inner sections of the bunsen burner and those of the mixing chamber have been so devised as to obtain with all pressures between 7-10ths and 24-10ths a mixture rich in air and at a rapid rate of flow above the gauze of the burner; the effect being to produce very hot flames of high illuminating power. They are made for outputs ranging from 2 to 6 cubic feet.

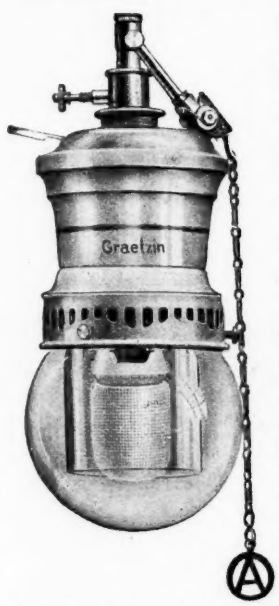


To allow of the easy adjustment of the burner A, when this is furnished with a central pilot-light the gas-injector is fixed directly upon the conical collar C, mounted upon the gas service-pipe. The burner is screwed on to an intermediary piece B, which makes a joint with C. By this means the adaptation of the burners to automatic lighters is extremely easy, and the escapes which are produced when leathers, forming the joint between the burner and the support, screwed one upon the other, become dry or cracked, are avoided.

A NEW CERIUM LIGHTER.

Cases will readily occur to one in which the use of matches for lighting-up gas-burners might be considered undesirable—such as in shops, warehouses, &c., where inflammable material is stored, and a match carelessly dropped or thrown down might prove a source of danger. The employment of matches is, of course, quite unnecessary; and there are many large gas installations where this method of lighting up never has to be resorted to. This "matchless" lighting may be secured either by means of a continually burning bye-pass or by spark ignition.

To the latter type the British Graetzin Light, Limited, of Chapter Street, Westminster, S.W., have added their "Graetzin" cerium lighter—an unobtrusive and inexpensive little appliance, which does away with the need for a bye-pass. It is suitable for all inverted gas-lamps, and is placed between the burner and the fitting. The difference in shape of these lamps does not matter; for the loosening of a screw permits the igniter to be placed at just the angle at which the pilot-flame will be in the best position for lighting the gas at the burner. It may be pointed out that a good plan in fixing is to arrange the lighter so that it is out of the direct path of the heat passing from the top of the lamp. A glance at the illustration will make clear what one has to do to operate the igniter, when it has been placed in position—simply pull a chain. This pull both admits gas to the pilot and strikes a cerium spark; and when the flame has spread to the main gas supply inside the lamp, the chain is released, and the pilot-gas supply is shut off. There is in the appliance a tube filled with a stick of cerium; and as this wears, there is provision for forcing the remaining portion forward. It is calculated that a stick will give about 25,000 flashes; and when it has come to an end a new one can be supplied at a cost of round about a penny. So far as the cerium is concerned, therefore, the cost of maintenance may be disregarded; and in other respects we are assured that the lighter (upon which much thought and trouble have been expended) will prove as satisfactory in everyday working as it did when inspected last week in the Company's show-room.

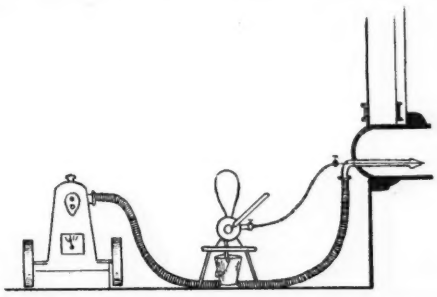


The "Graetzin" Cerium Lighter.

To have the means of lighting attached to a lamp is a convenience, for boxes of matches are not invariably at hand when required; and when they are, less trouble is involved in the pulling of a chain than in taking out a match, striking it on the box, and then applying the light to the gas. But the principal advantage claimed for the use of a cerium igniter is that it does away, in an economical manner, with any means of producing light which could be a danger in circumstances such as those mentioned in the opening lines of this notice. It has been said that the lighter is unobtrusive and inexpensive; and it may be added that such attention as it might attract would hardly be detrimental to it, for it is well finished, and not likely to look out of place on any lamp.

RAPID METHOD OF SCURFING RETORTS

In the course of a communication to the Belgian Gas Association, M. Schmidt described various methods of scurfing retorts; among them being one which has been in use at the Louvain Gas-Works for the past four years. The appliance used is a "Centrator" blower, actuated by a 2 H.P. gas-engine. It makes from 3600 to 3900 revolutions per minute, and in this period delivers 700 cubic feet of air at a pressure of about 6 inches of water. The blower is worked by means of encased steel rollers, which have to be kept well lubricated; and when they are worn out all that is necessary is to replace them. The engine and blower combined occupy but little space. The carriage measures only 4 ft. by 3 ft., and it can be easily moved. The engine cylinder is cooled by water conveyed by a flexible tube. When a retort has to be scurfed, the machine is drawn up near the setting, and a pipe of galvanized or ordinary iron is fixed from the outlet of the blower and run into the retort to about half its length. The engine is then started, and the removal of the scurf at once begins. About two hours only are required to clear a retort.



Taking the case of gas-works having ten settings of nine 10-feet retorts, M. Schmidt gave the cost of scurfing one setting as 11 frs. 10 c.; and reckoning twelve operations in a year the total cost would be 133 frs. 20 c.—say £5 6s. 6d.—or for the ten settings £53 5s. Notwithstanding that the greater part of the graphite is burnt, an appreciable quantity is saved, the disposal of which helps to cover the cost of maintenance and the sinking-fund charges. Compared with similar works in which the old method is used, M. Schmidt gave the cost of scurfing one setting as 76 frs. Four operations a year would cost 304 frs.; and the total annual expense for dealing with ten settings would be 3040 frs., or £122. From this there would have to be deducted the return from the sale of the graphite. From 10,000 to 12,000 kilos. of this would be produced, worth 5 frs. per 100 kilos., or 600 frs. (£24), which would bring down the cost to 2440 frs. (£98). The other method, therefore, shows a saving of about £45. The great advantage of forced injection of air is that the works are able to produce more gas owing to the fact that the retorts can be charged more rapidly; thereby ensuring economy of labour and heating. Indeed, the productive capacity of the works is increased by somewhere about 3½ per cent.

Scottish Junior Gas Association (Eastern District).—We learn from the Hon. Secretary (Mr. Lawrence Farquhar, of Alloa) that the second quarterly meeting will be held on Saturday afternoon in the Masonic Hall, Dunfermline; and that the following papers will be read: "Foundations," by Mr. K. Mackay, of Falkirk; and "Recent Developments in Distribution at Dunfermline," by Mr. R. M. Simpson, of Dunfermline.

An Alcohol Committee.—An Alcohol Motor Fuel Committee has been formed by the Imperial Motor Transport Council, to conduct investigations into the possibility of obtaining adequate supplies of alcohol suitable for motor fuel at sufficiently low prices. Upon the Committee are Mr. Samuel Glover, M.Inst.C.E., Professor Vivian B. Lewes, F.I.C., F.G.S., Dr. W. R. Ormandy, and Sir Boverton Redwood, Bart. The Hon. Secretary is Mr. Horace Wyatt, B.A., of the Royal Automobile Club, Pall Mall, S.W.

Gas-Engines in the Past Year.—Referring to this matter in the Engineering Supplement last Wednesday, "The Times" remarked that few novel features had been introduced during the past twelve months in gas-engines; the chief point of interest being the increasing employment of fuels other than coal in places where they are readily obtainable. "So much experience has been gained with the gas-engine during the last decade, that one is inclined to consider its design as near the limit of perfection as that of the steam-engine—at any rate, so far as the present-day type is concerned. But the gas-turbine still remains an unsolved problem commercially; and there is absolutely no practical development to be recorded during 1913." Only in one phase, says the writer of the article, does the development of the gas-engine seem to be at a standstill—its use for marine purposes; and hopes raised a few years ago are, he says, far from being fulfilled.

DISTRIBUTION EXPERIENCES IN QUEBEC.

At the Sixth Annual Meeting of the Canadian Gas Association, a paper on the subject of mains and main-laying was read by Mr. R. A. Wallace, the Superintendent of the Gas Division of the Quebec Railway, Light, Heat, and Power Company. In the course of it he gave the following particulars of the gas distribution system in the city, which, according to some photographs shown by the author, furnished several striking examples of injudicious arrangement.

The ever-increasing number and extent of sub-surface constructions, the more general use of heavy or high-speed vehicles on the surface, and the adoption of the street pavements generally known as "permanent," all tend to produce causes and effects which demand most careful consideration on the part of distribution engineers, if we are to keep our systems of piping in anything like a satisfactory condition, and avoid heavy expense in maintenance. The stability of the pipes and the soundness of the joints are greatly lessened by the settlements which invariably follow as a result of other excavations close to the pipes, and by the increased vibration due to the heavier traffic on the surface. This must naturally bring about a greater amount of loss by leakage; and since the new pavements have usually been laid on a foundation of concrete, the escaping gas, which under former conditions found its way through the surface, is now forced into adjoining conduits or through the walls of neighbouring buildings, in any of which it may accumulate in quantities large enough to become an element of great danger. In this connection, a recital of some recent experience in the City of Quebec may be of interest to members of the Association.

Previous to the year 1907 there were in use about 18 miles of mains, in sizes from 2 to 10 inches diameter; while the greater number of services were also of cast iron 1 inch internal diameter. The joints were either the standard lead or turned and bored kind; the pipes all being laid deep—say, an average of 5 ft. 6 in. below the surface. They had been in use a considerable time—some more than fifty years. According to the records then obtainable, the pipes seemed in fairly good condition. The unaccounted-for gas, so far as could be determined, had not been excessive, and the number of broken pipes rarely exceeded two or three per year—the breaks usually occurring during the winter months. The property having changed ownership, extension of the system was decided on in 1907, and at the same time a second company started operations.

Conditions under the surface of the roadways were perhaps different from those existing in any other Canadian city. The streets for the most part are narrow and crooked. In what is known as the Upper Town section solid rock is met with in many cases at the surface, but in most parts at a depth of 3 to 4 feet below; while in the Lower Town section high-tide water would be encountered at the same depth. In almost all the streets brick tunnels have been built, extending from the water-pipes in the centre to the fire-hydrant valve-chambers in the sidewalk, and at right angles to the line of the street. The tops of these tunnels come within 3 feet or less of the surface. In the winter months frost enters the ground to a depth of approximately 6 feet.

The questions demanding first consideration were the depth at which the pipes should be laid, having in view the climatic conditions, with the extra cost of rock excavation, and the existing tunnels, through which the Water-Works Department would not allow the pipes to pass. There is also the liability to damage during blasting operations to be reckoned with in the selection of materials.

It was decided to lay the pipes with an average of 3 ft. 6 in. cover, in which position we could avoid hard rock excavation, and would be able to pass through the roofs of the tunnels without encroaching to a great extent on the working space below. For the larger-sized pipes, from 8 to 20 inches diameter, cast-iron pipe with lead joints was used altogether. For the sizes from 6 to 4 and 3 inches diameter, cast-iron pipe with lead joints, standard wrought-iron or steel pipe with screwed joints, plain-end pipe with Dresser joints, and Mannesmann steel hub and spigot pipe, coated and wrapped—some lines with cement and some with lead joints—were selected. About 20 miles in all were laid by the two companies in one year.

No provision having been made in the Charters regarding encroachment on the gas-pipes, and no system of regulation being in existence, foreseeing possible trouble, an application was made to the Courts for an injunction to restrain other concerns from excavating within 3 feet of the gas-pipes. The injunction was refused, on the ground that Federal Acts did not apply to corporations operating exclusively under Provincial Charters.

In 1908 extensive permanent pavement operations were decided upon by the city authorities; and following these immediate work was begun on the extension, improvement, or repairs of every construction under the streets. No understanding as to any systematic arrangement existed between the different concerns interested, and both went ahead as best suited their immediate requirements. As in some streets there are two sets of underground telephone conduits and two water-mains in a total width of 30 feet or less, it is easy to understand that trouble was sure to follow. The number of complaints of escaping gas increased; and as these were invariably made during the winter months, when climatic conditions made the work both difficult and expensive, it was decided in the spring of 1912 to overhaul thoroughly all the main-pipes in districts where trouble had occurred.

About ten miles of pipe have been uncovered, thoroughly inspected, and where necessary repaired. Most of the trouble was located in the small cast-iron pipes of 6 inches and less diameter. Only six actual breaks were found, and these were directly traceable to the fact that the pipes had either been undermined during the progress of other work, or had been broken by the weight of other structures, such as valve or manhole chambers being built directly on top of the pipes. It is also significant that all the breaks were found in the pipes which had been laid deep. In one case—a 4-inch wrought-iron pipe with screwed joints, laid at a depth of 3 feet, in which no expansion joint had been provided in a length of 900 feet—one coupling was found drawn. Every rubber gasket joint was found to be perfectly tight, and the steel or wrought-iron pipes which had been in use from five to ten years did not show any decided evidence of corrosion. In fact, the lines of this type were found in such good condition that it was deemed unnecessary to examine any greater length of them. In the case of the covered steel pipe, the burlap covering was found to be almost as sound as when it had been laid five years previously. The lead joints in the steel pipe showed the same weakness as in the cast iron; and a slight leakage was found at several joints in comparison with cast-iron pipe. However, this was materially lessened, owing to the greater length of pipes and the fewer joints employed.

The portland cement joints in the Mannesmann pipe were considered so unsatisfactory that the cement was removed and the joints re-made with lead. This, however, must not be regarded as a condemnation of the more general use of cement in main-joints. The failure may have been due to the quality of the cement used, to the mode of its application, or to the somewhat limited space between the hub and spigot in this particular line. The writer has in some other cases used portland cement joints with excellent results. The turned-and-bored joints on the cast-iron pipe had all been in continuous use for long periods—some of them fifty years—yet in not one instance was anything but a very slight leak found. This type of joint, however, is not suitable for use where even slight deviation from straight lines is demanded, and therefore it cannot be recommended under our existing conditions.

The practice of barring from the surface, in an endeavour to locate a serious leak, has in our case proved to be almost useless, for the reason that, owing to the open character of the material beneath the roadways, and the existence of many old wooden box drains, the escaping gas will often travel long distances before making its presence felt. This has occurred in some cases at a distance of several hundred feet from the actual source of trouble. During the past two seasons we have had no less than seven cases of broken cast-iron pipes as the result of blasting operations. In three instances the pipes were completely shattered, and the escaping gas set on fire.

We have now in use in Quebec upwards of 50 miles of main pipes and 4700 services, most of which are laid within the frost line; yet, notwithstanding a minimum temperature of 30° below zero, no trouble from frozen mains has been experienced during five years, with the exception of one instance in which at high tide water entered the main through a broken drip suction-pipe. The drips, with the exception of those on the trunk lines in the vicinity of the holders, do not require attention more often than once every three months; while the number of complaints of frozen services between Dec. 1, 1912, and April 1, 1913, totalled 307—an average of less than three per day.

The experience in Quebec would suggest a more general use of steel or wrought-iron pipe for gas-mains, as being, all things considered, the most satisfactory and economical to meet the prevailing conditions, since with the longer lengths the number of joints and liability to leakage are reduced. The steel pipes also resist to a greater extent the strains due to subsidence and withstand the shocks from blasts let off in their vicinity.

Low-Temperature Carbonization of Coal.—This was the subject of a paper read by Mr. H. N. Beilby last Tuesday, at a meeting of the Scottish Section of the Society of Chemical Industry. He remarked that two important demands had been created by modern industrial progress—viz., large supplies of fuel oil for the generation of power, and a smokeless solid fuel that would be instrumental in the purification of the atmosphere and at the same time tend to conserve the mineral wealth of the country. Both might be met to a large extent by products resulting from the carbonization of coal at low temperatures. Some half-dozen experimenters were now at work on the subject. The whole problem resolved itself into the production of a simple yet efficient apparatus. There was a short discussion, in which Dr. Gray, of the Royal Technical College, and Mr. Alex. Wilson, the General Manager and Engineer of the Glasgow Corporation Gas Department, took part.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Coke-Oven Practice.

SIR,—I enclose the following particulars in reply to remarks of "Modus Operandi" in your issue of Jan. 27.

The coal at coke plants is usually washed first, disintegrated second, and finally compressed into a very compact cartridge, which is inserted in the coke-oven. The probable result of this practice with gas-retorts would, in the writer's opinion, tend towards a better output of round coke, with much less breeze, better yields of bye-products, and, in conjunction with an extension of the carbonizing period, would give a satisfactory foundry coke.

With reference to the value of the 400 cubic feet of gas, I do not quite see that the works cost should be taken. I assume that with heavier charges the same plant and staff are made to deliver an excess of 400 cubic feet. Therefore, for the same capital and maintenance charges and carbonizing wages, we derive this advantage; and hence these charges should not be deducted—the only deduction, in my opinion, being the cost of purification and distribution of the 400 cubic feet—probably under 6d. per 1000 cubic feet—leaving a net value of 2s.

The "free space" figures were calculated on the sizes of the retorts given—22 in. by 16 in. by 20 ft., taking coal as occupying a volume of 43 cubic feet per ton. I took 6, 8, and 12 cwt. as average weights for light, medium, and heavy charges respectively. As far as costs of coke-ovens, &c., for the items stated, I give the coke-oven figure with confidence. The figures for horizontals and verticals were calculated from data in Scott's "Estimates and Valuations." Calculating the figure for horizontals, I took the precaution to compare the figure with those of similar sized gas-works. Taking the average, I found my figure was slightly below the actual figures quoted. As to verticals, your readers will doubtless agree that there is considerable variation in published figures; and I took the average of published data from five distinct plants. I am somewhat surprised to hear that the impression exists that coke-ovens are much more expensive than the old type of retort. This impression is very far removed from the experience of the writer.

J. E. CHRISTOPHER.

Kirkless Coke-Works, Wigan,
Jan. 28, 1914.

Frost and the Cover of Gas Mains and Services.

SIR,—I have read with interest the instructive paper by Mr. Alex. Paterson, and the discussion on it, reported in your issue of Dec. 23 last. Perhaps the following information might be of interest to your readers.

In Eastern Canada (Montreal and Quebec) I have found that it is the custom to lay mains with an average cover of 3 feet, and, as the frost penetration is between 5 and 6 feet, some years many of our mains are frozen-in for four months of the year.

Regarding frozen pipes, this trouble only occurs in mains, when of too small a diameter; and, if 4-inch be the smallest main laid, then, with proper attention paid to fall, there will not be any frost trouble. As regards services, 1¼-inch is the smallest we run to-day, and again, if the fall be carefully watched, there is only a slight frost danger. In fact, nearly all our frost troubles are due to bad workmanship and small pipes of past days.

The temperature at the moment of writing is 24° below zero.

H. N. W.

Jan. 28, 1914.

St. Bartholomew's Church.

SIR,—With reference to Mr. Dunphy's letter in the last "JOURNAL," I have not been in church since the latter part of November; but on that occasion the lighting was as I described it.

There may have been one or two incandescent lights in the porches; but I referred to the body of the building.

P. BENHAM.

P.S.—I regret I have seen no reply to my letter with reference to the cost of water heating by gas.—P. B.

Jan. 30, 1914.

REGISTER OF PATENTS.

Quenching and Loading Coke.

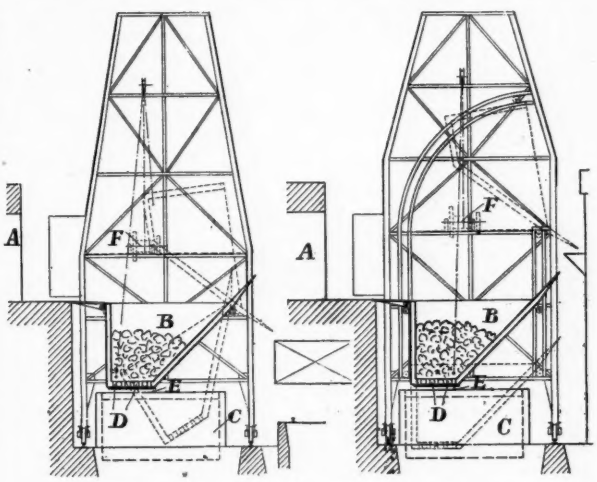
FRANZ MÉGUIN AND CO., A. G., and MULLER, W., of Dillingen-Saar, Germany.

No. 1430; Jan. 17, 1913.

This present invention relates to apparatus for quenching and loading coke in considerable quantities, as from chamber retorts, coke-ovens, &c.

The essential characteristic of the invention is that the receptacle for the quenching water is separated from the coke transporting medium and arranged stationary apart from it; the transporting medium being provided with a coke receptacle with imperforate sides, which are made double for the purpose of receiving cooling water, and through the double bottom of which receptacle quenching water inlet tubes run. In order that the admission of air to the glowing coke before the coke receptacle is immersed in the quenching receptacle may be prevented, the lower ends of the tubes through which the water enters are simultaneously closed by a movable plate.

The procedure with the apparatus illustrated is as follows: The coke is forced out of the chamber A into the coke receptacle B of the transportable machine, and conveyed at once to the water receptacle C fixed in any place in front. Here the coke receptacle is gradually let down, so that the water ascends through the inlets D arranged in the bottom and quenches the coke. The time occupied in the travel of the whole machine with the coke from the discharged chamber to the water receptacle is not a matter of any importance in connection with the apparatus, because the rate of travel of the relatively light machine may be sufficiently great to prevent any injurious waste of coke. For the purpose of preventing the air from reaching the coke through the



A German Coke Quenching and Loading Apparatus.

inlets D before the quenching is effected, their lower ends can be closed by a movable perforated plate E before the immersion takes place. When the quenching has been effected, the coke receptacle is removed from the water by a winch F and raised so that the whole machine can be moved away freely over the water receptacle, and discharged either directly into railway trucks, &c., or into stock.

Two different devices for discharging the coke receptacle are illustrated. The second one shows a combination of the quenching device and the well-known tilting lifting box device. The discharging is effected by the coke receptacle being raised rectilineally, while in the highest position it gradually assumes an oblique position automatically through suitable guide arrangements, so that the coke is gradually thrown out at the slightest possible angle.

Gas-Mantle Rings.

SWANSON, T. W., of Edinburgh.

No. 5719; March 7, 1913.

According to this invention, the mantle ring is provided with two projections or lugs forming supports in radial alignment on the inside (or on the inside and outside); the internal projections or lugs being curved on their under surface to allow the ring to swing on the flat projections or lugs on the nozzle of the burner—"thereby decreasing the effects of shocks or jars on the mantle, and consequently increasing the durability of the same." The two internal projections or lugs on the ring are for supporting it, and the external ones, which are not used for supporting the ring, can be employed for handling it.

Incandescent Gas-Mantles.

ROBIN, J. I., of Great Titchfield Street, W.

No. 18,173; Aug. 9, 1913.

This invention relates to means for strengthening and reinforcing mantles "without in any way interfering with their ordinary functions."

The mantle is made in the manner described in patent No. 566 of 1910 from a series of corrugated or zig-zag threads which are reinforced by asbestos or other non-combustible threads or wires or the like, secured to the mantle at the top and bottom, but at no intermediate point, "so that the threads are quite free from the main body of the mantle." The arrangement therefore is such as "will not interfere with the resiliency of the material from which the mantle is formed nor with its light-giving qualities, while providing a reinforcement for strengthening purposes."

Drilling and Connecting Branch Mains under Pressure.

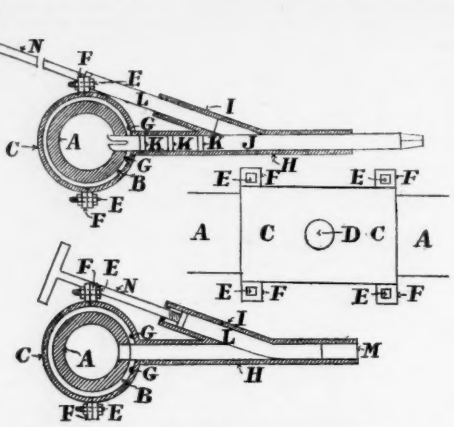
BOYLE, T., of Ormskirk.

No. 4894; Feb. 26, 1913.

An illustration of this arrangement is given, showing the main being drilled and with a flexible plug in position, and the drill being withdrawn and the flexible plug partly in the ferrule. There is also an elevation

showing the position of the ferrule in the band which closes round the pipe to be drilled.

A is the main to be drilled, and B a wrapper of asbestos or other suitable material wrapped round a portion of it. The split bands C are then placed round the main with the ferrule H exactly over the part to be drilled. When this is done, the bolts E passing through lugs F in the band are screwed up tightly, thus pressing the projecting ribs G in the band with the asbestos wrapper and preventing any escape through the band. The drill J, with washers K, is then inserted in



Boyle's Connector for Mains under Pressure.

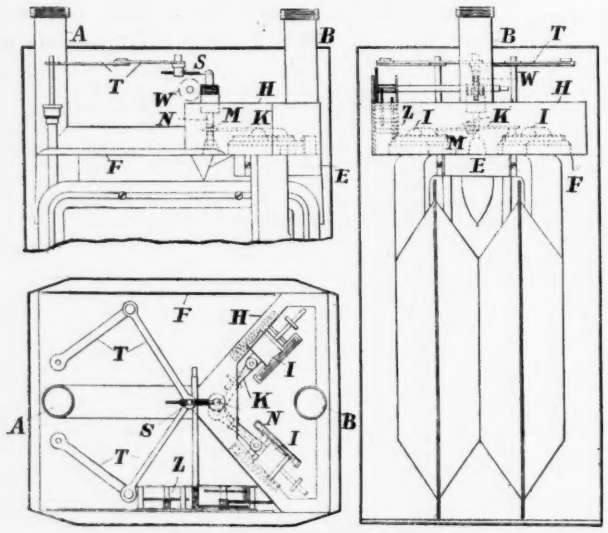
the ferrule H; the flexible plug L being placed in position in the shoot I. When this is done, the main is drilled through, the drill withdrawn, and the flexible plug L pushed down one half into the ferrule H, the other portion remaining in the shoot I; thus preventing any escape through the ferrule or shoot. When the connection is made at M, the flexible plug is withdrawn into the shoot, the steel rod N is unscrewed from the flexible plug, and a cap placed on top of the shoot.

Gas-Meters.

HIBBERD, C. E., of Tooting Bec, S.W., and GOAD, F. L., of Edinburgh.

No. 9664; April 24, 1913.

This invention relates to dry gas-meters of the type having valves operated by reciprocating diaphragms, as described in patents Nos. 6463 and 6464 of 1912; the primary object of the present invention being "to provide a gas-meter of simple and cheap construction with its working parts readily accessible for purposes of adjustment." Another object is "to provide a commercially practicable meter, the outer walls of which can be perforated at any point without an escape of gas."



Hibberd and Goad's Dry Gas-Meter.

A pair of measuring chambers are provided arranged back to back in the usual manner—each formed of a pair of plates of rectangular shape with inclined portions running out to butting flanges, between which the diaphragms are secured, so that the latter oscillate about their central position of support. Suitable ducts connect the interior of the measuring chambers to the valve base E, which is preferably mounted on a plate F, which carries the various parts of the meter now to be described.

The plate F is provided at one end with a valve-isolating gas-tight chamber H, of triangular form, with the apex near the centre of the plate and the base coinciding with the end of it; the lower wall of the chamber being formed by the supporting plate F itself. The chamber encloses the valves I (of the usual D-form), which reciprocate in paths parallel to the side walls which meet at the apex. They are operated by connecting rods K, which engage with a common crank M on a vertical crank shaft N, which passes through the top wall of the gas-tight chamber by way of a stuffing-box. The shaft at its upper free end is provided with a crank arm carrying a pin S, adjustable in a radial direction, and connected by the usual double links T to vertical flag rods which pass downwards into the measuring chambers, and are operated by the usual flags reciprocating with the diaphragms. The portion of the shaft N disposed above the gas-tight chamber carries a worm, which engages with a worm-wheel W mounted on a horizontal shaft, and operates the usual registering train Z, which is itself carried by the plate F.

Gas is led to the interior of the valve-chamber H by a vertical inlet pipe A, carried by the supporting plate at the end remote from the valve-chamber, and by a connection arranged above the supporting plate and integral with it, and running from the base of the inlet pipe to the interior of the chamber. The gas-ducts from the valve base are secured to the supporting plate in a similar manner; the outlet B passing gas-tight from the exhaust passages through the supporting plate F and the upper wall of the valve chamber H.

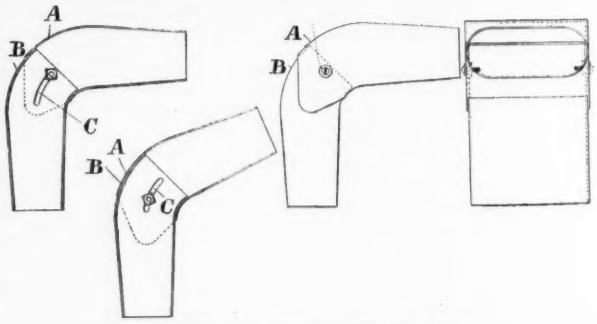
The patentees say they believe that they are the first to provide a meter in which the outer casing can be perforated at any point without escape of gas, and that quite obviously the principle by which they attain this result can be embodied in different forms. Consequently they do not limit themselves to the precise construction of measuring chamber described, nor to the mechanism by which the diaphragms operate the valves. Many such flag-operated mechanisms are known; and that described in their patent No. 6464 of 1912 might readily be adopted for the purpose. Whatever the exact form of the constituent elements adopted, a meter constructed in this manner is, they point out, "very readily accessible for purposes of overhaul, and at the same time can be cheaply constructed."

Elbow or Bend for Metal Pipe-Flues.

GLOVER, T., of Gothic Works, Edmonton.

No. 14,792; June 26, 1913.

In carrying this invention into effect, an elbow of two members is formed, each of which consists of a length of tube (oval or circular in cross section), one end of which is preferably made rectangular in cross section and bent over or curved as at A B. Both members have the same curvature. The curved rectangular part of one tube is made slightly larger than the other tube, so that one can be placed in the other and "form a fairly tight joint." In each side of one of the members (preferably the smallest) and at the curved portion, a slot C is made conforming to the curve of the part; and in each side of the



Glover's Adjustable Elbow for Gas-Fire Flues.

other member a hole is made which, when one member is placed over the other, will coincide with the slots. Through the holes and slots bolts are passed secured by nuts. By sliding the curved end of one member over the other member, the tubes will take different angles to each other (as shown) within the limits of the slots; and, when the desired angle is obtained, the nuts and bolts are tightened-up and so clamp the two members together. The sides of the member having the holes are formed with curved extensions which cover the slots when the members are at the smallest angle to each other.

Safety Devices or Automatic Cut-Offs for Gas-Burners.

CHIPPENDALE, H. A., and KIMMELL, M., of Providence, Rhode Island, U.S.A.

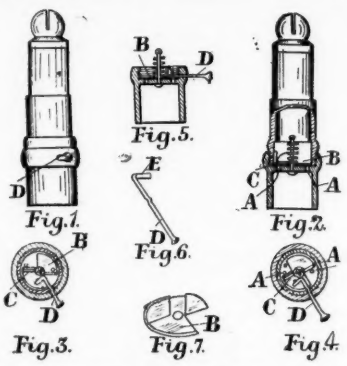
No. 23,343; Oct. 15, 1913.

This invention is designed to prevent the escape of gas from the burner when the cock in the pipe is accidentally opened or thoughtlessly manipulated by a person who is not familiar with the danger caused by escaping gas, or after the gas which is ignited at the burner is extinguished by being cut off by any reduction of the pressure in the gas-main.

There is provided within the burner a disc-shaped valve which is caused by a spring to normally cover the gas inlet openings to the burner, but which is retained in such a position that the openings are uncovered by the flow of gas which impinges upon blades which are bent upwardly from the valve—the spring moving the valve to close the openings directly the flow of gas ceases. The device also comprises a stem adapted for manipulation, to initially move the valve to open the gas inlet.

The burner (as shown) is provided with a lower tubular part formed, adjacent to its upper end, with a diaphragm provided with opposite

perforations A for the passage of gas, and controlled by a valve B, formed from a round disc of flat material. slit from its edge towards its centre at opposite points. The material between the slits and the periphery of the disc is bent up to form blades, also to provide the valve with spaces to permit the free outflow of gas through the perforations, when the valve is in the position illustrated in fig. 4.



Chippendale and Kimmell's Safety Burner.

The valve is provided with a central opening through which a pin extends upwards from the diaphragm; and, surrounding the pin, as well as having one of its ends attached to it, is a spring provided with an extending arm C which normally bears upon one of the blades to rotate the valve and cause it to close the passages A, and thus shut off the gas from the burner tip. One of the blades, coming into contact with a stop-pin upon the diaphragm, limits the movement of the valve about the pin.

A valve operating stem D extends through openings in the burner and is retained therein by a kink. A knob on the stem enables it to be turned (after the tap has been turned on) so as to bring the off-set portion E, which is resilient, into impingement with one of the blades, and move the valve into the open position—the rod being subsequently turned into the position shown in fig. 3. The impingement of the gas against the blades will then keep the valve open until the gas is turned off or the pressure in the main diminishes, when the spring will move the valve into closed position again.

LEGAL INTELLIGENCE.

DISCS FOR PENNIES IN PREPAYMENT METERS.

A Consumer Committed for Trial.

At the Manchester City Police Court last Thursday, Jane Roberts, a married woman, of Guy Street, Ardwick, was charged under the Debtors' Act with obtaining credit by means of fraud other than false pretences.

The case was before the Court earlier in the week, when Detective Inspector IDSON said the prisoner was apprehended on the charge of stealing gas by putting discs into a prepayment meter, and thereby obtaining gas to the value of 1s. 8d. The prisoner had, he said, been twice previously cautioned by officials of the Corporation about the practice, and she promised to refrain from it. It was, however, found that she persisted in inserting the discs; and he took her into custody on the charge of stealing gas.

The STIPENDIARY (Mr. Edgar Brierley) asked whether the authorities were really satisfied that the woman had no intention of eventually paying for the gas.

Mr. A. F. L. PICKFORD (Solicitor to the Manchester Corporation) replied that this was not an isolated instance of the woman's conduct in this respect. The gas was, he alleged, fraudulently obtained. The prisoner had been warned two or three times, and on one occasion more than twenty tin discs were found in the meter. Notwithstanding this warning, she had put in additional discs.

The STIPENDIARY: But has she offered to pay?

Mr. PICKFORD: That would be opening the door to fraud. The woman certainly said she would pay the following Saturday.

The STIPENDIARY agreed that there was a difficulty in the case, because the woman was of settled abode; and the charge of fraud did not quite come within the cases cited in regard to stealing from railway station automatic machines. He agreed, however, that the case was a serious one from the point of view of gas undertakings generally.

Mr. PICKFORD said that, in any case, it was fraudulent abstraction of a commodity; and he submitted that this amounted to larceny.

Mr. H. DARNTON JUDSON, who appeared for the defence, submitted that there was nothing fraudulent about the woman's actions. She was not charged with tampering with the meter, and the index clearly showed the amount of gas consumed since the collector paid his last visit. It was not an unusual thing for a prepayment meter consumer to redeem discs in the way his client had proposed to the collector. If the discs were not redeemed—they had been redeemed before—the Corporation ought to have issued a summons against the woman for the money and not arrested her.

The STIPENDIARY said there was some point in this argument, if it was true that the discs had been redeemed on previous occasions. But, in any case, the woman had obtained gas on credit, whereas she was only entitled to a supply for cash. He was not sure whether the prisoner had not committed an offence under the Debtors' Act in obtaining credit by fraud, because she was only entitled to a gas supply on the prepayment system.

Mr. JUDSON argued that the prisoner could have easily obtained three months' credit by installing an ordinary meter.

Mr. PICKFORD: No; I am told that the value of the whole of the furniture in the house, and the general surroundings, would not warrant credit terms being given in this case.

The STIPENDIARY: Whether she would have been granted credit or not is another matter. In this instance her contract was to pay cash for all gas consumed.

Mr. PICKFORD said gas had been unlawfully obtained from the meter.

Mr. JUDSON insisted that there was no fraudulent intention to defraud the Corporation, because when the discs were discovered the prisoner said she would redeem them by a cash payment.

Mr. PICKFORD submitted that the Corporation had a strong case, having regard to the circumstances the prisoner was in. She had really not the means to pay for the gas so fraudulently obtained, as he alleged. If the learned Stipendiary found any difficulty in the case, he would apply for an adjournment, in order that a charge might be preferred under the Debtors' Act. He did not, however, intend to withdraw the present charge.

The proceedings were resumed last Thursday, when the prisoner was charged with obtaining credit by fraud under the Debtors' Act of 1869. A further and alternative charge was also preferred under section 19 of the Gas-Works Clauses Act, 1847, which specifies that no person should "improperly use" the gas.

Mr. PICKFORD said these were the words he relied upon; and, in addition to this charge, a certain amount of damage had been done to the meter. This was supplied by the Corporation on the understanding that gas was to be used in a certain manner—viz., by inserting a penny, and thus obtaining a specified number of cubic feet of gas. There had undoubtedly been "improper use" of the gas by the insertion in the meter of tin discs instead of coins. With regard to the charge of obtaining credit and incurring debt by frand, he thought the facts needed no argument, as all the essentials were present. Did the woman obtain credit by fraud?

The STIPENDIARY said that when the woman was arrested her reply in regard to the first charge was: "I am very sorry. I intended to pay for it." This statement was the difficulty which presented itself to the Court at the last hearing.

Mr. PICKFORD: Yes, Sir; but I find a case, *Regina v. Francis Naylor*, cited in Archbold, and reported in Cox's "Criminal Law Cases," Vol. X. (1864-1867), p. 149, which covers the ground. It was argued there that when a person obtains credit by false pretences, without having the means to do so, that is an offence. The woman's statement that she "intended to pay" was no answer to the charge of fraud.

Mr. JUDSON said he took exception to the charge preferred under the Gas-Works' Clauses Act, because the woman had procured the gas through the meter, and used it in the ordinary way.

The STIPENDIARY agreed, and said the case really came under the Debtors' Act. In a sense, however, the woman had certainly improperly used the gas; but the point under the Debtors' Act could be argued by Counsel when the case came on for trial at the sessions. He was afraid, however, that this was a cumbrous way of dealing with so small a matter. At the same time, the point was important to gas undertakings generally; and he proposed to send the case for trial.

The charge under the Larceny Act was then dismissed, and the case proceeded under the Debtors' Act. Prisoner was charged with unlawfully incurring a debt or liability to the Lord Mayor, aldermen, and citizens of Manchester by obtaining credit by means of fraud.

Evidence was given by a prepayment meter inspector, who said he visited the house in October and found a disc among the pennies in the box. He cautioned the prisoner against the practice of using discs; and she explained that the disc had been inserted because she had no pennies at the time. She promised not to repeat the offence, but again in December he found two discs in the box. He asked prisoner for two pennies for them; but she replied that she had no money. He again warned her about her conduct. On a subsequent occasion he found 21 similar discs in the box, which indicated that 800 cubic feet of gas had been taken, representing the value of 1s. 8d. He showed them to the prisoner, and she explained that, in her absence, her children must have been playing with the meter. Witness pointed out that her story was hardly to be credited, as the discs had been cut to the exact size of a penny. To this remark she afterwards observed that she had only a halfpenny in the house, and could not pay the amount due.

In cross-examination, witness said that, if he had been offered the 1s. 8d. by the prisoner, he would have accepted it. He would not, however, have given her back the discs, but have taken them to the office. On one occasion, when he found a disc in the meter, he gave the woman credit for it; expecting that she would make up the money the next time he called to clear the box. He could not, however, remember that she offered to pay the 1s. 8d. All she said was: "What will they do with me?"

Charles Edwin Capon, a Chief Inspector, said he, too, had warned the prisoner against putting discs into the meter and unlawfully obtaining a supply of gas.

In reply to the formal charge, the prisoner said she was not guilty. On the advice of her advocate, she did not call any witnesses.

Mr. JUDSON said, in view of the fact that the Stipendiary had decided to send the case for trial, he would not argue the legal points involved in the case. He asked, however, that the woman should be admitted to bail pending the trial.

This request was granted; the prisoner being released on her own recognizances to appear at the next Quarter Sessions.

Water Supplies in the Newtownards Districts.—Mr. A. D. Rice, Engineering Inspector of the Irish Local Government Board, last week held an inquiry into an application by the Newtownards Rural District Council for sanction to a loan for providing water supplies in areas included in Bangor, Comber, Donaghadee, Greyabbey, Kilmood, and Newtownards districts.

MISCELLANEOUS NEWS.

GAS TESTING AT MOSSLEY.

Use of the No. 2 Burner Sanctioned.

A report appeared in last week's "JOURNAL" (p. 243) regarding a Board of Trade inquiry into an application on behalf of the Mossley Corporation for the approval of the Board to the adoption of the "Metropolitan" No. 2 burner for testing purposes; opposition being offered by the Saddleworth Urban District Council, who asked for some concessions from the Corporation, if the use of the new burner were approved.

The Board of Trade have now sanctioned the employment of the "Metropolitan" No. 2 burner for testing. In giving their decision, they did not impose any conditions upon the Mossley Corporation. The Corporation, however, have agreed to use the Harcourt ten-candle pentane lamp in place of candles as the light standard, and to bear the cost of converting a number of flat-flame lamps to the incandescent system for the Saddleworth Council.

BRENTFORD GAS COMPANY.

Half-Yearly Report and Accounts.

At the Ordinary General Meeting of the Brentford Gas Company on the 13th inst., the Directors will report that the business in the half year ended the 31st of December was again satisfactory; the increase in the quantity of gas sold having been 4·26 per cent. more than in the corresponding period of the previous year. The total number of consumers is now 105,847, against 101,503 last year; and the use of stoves, for both heating and cooking, is largely extending. At the close of the ordinary meeting, a special meeting will be held to consider, and, if thought fit, approve, of a Bill which it is proposed to introduce into Parliament to consolidate and convert the capital of the Company, to authorize the acquisition of the undertakings of the Staines and Egham District Gas and Coke Company, Limited, and the Sunbury Gas Consumers' Company, Limited, and to confer further powers on the Company; also of agreements for the acquisition of the above-mentioned undertakings.

The accounts accompanying the report show that the revenue from the sale of gas amounted to £197,313; from the rental of meters, stoves, and fittings, to £31,646; from the sale of residual products, to £51,397—the total receipts being £280,407, compared with £278,882 in the second half of 1912. The expenditure on the manufacture of gas was £165,025; on distribution, £45,982; and on management, £9022—the total expenses being £241,428, compared with £217,104 in the six months ended Dec. 31, 1912. The balance carried to the profit and loss account is £38,979, compared with £61,778 this time last year. The profit on the revenue account for the half year is £38,979. After providing for fixed charges, there remains the sum of £34,591, which, with the balance brought forward, makes £117,958 available for distribution. The Directors recommend the declaration of dividends at the following rates, subject to income-tax—viz., 5 per cent. per annum on the preference stock, 14 per cent. per annum on the consolidated stock, and 11 per cent. per annum on the new stock, 1881.

The working statements show that, under the supervision of Mr. Alexander A. Johnston, the Engineer and Manager, 91,312 tons of coal and 1,642,189 gallons of oil were used in the past half year in the production of 1,837,792,000 cubic feet of gas (including 740,238,000 cubic feet of carburetted water gas), of which 1,682,151,000 cubic feet were sold and 1,709,852,000 cubic feet were accounted for. The estimated production of residuals was: Coke, 57,089 tons; breeze, 6984 tons; tar, 1,131,454 gallons; ammoniacal liquor, 29,151 butts.

TOTTENHAM DISTRICT LIGHT, HEAT, AND POWER COMPANY.

The Half-Yearly Report and Accounts.

In the report to be presented by the Directors at the half-yearly general meeting of the Company on Saturday next, the Directors state that the sales of gas showed an increase of 48·7 per cent. compared with those in the corresponding six months of 1912; and there was an addition of 2523 to the number of consumers and of 5408 to that of the cooking and heating stoves in use. The Directors reduced the price of gas 1d. per 1000 cubic feet as from the reading of the meters at Christmas last—making the present price 2s. Coin-meter consumers will receive an additional cubic foot per penny. In accordance with the provisions of the Tottenham and Edmonton Gas Act, 1913, the Enfield Gas Company was amalgamated with the Company as from the 1st ult. Mr. John Walker Ford was nominated by the Directors of the Enfield Company as a Director of the combined Companies; and he has taken his seat at the Board. Arrangements are in progress for the supply of electricity in the Wood Green district. The plans for the necessary buildings are before the Local Authority, and orders have been placed for the more important items of plant. It is hoped that shortly after Midsummer the supply will be available. In compliance with the Act, the title of the Company has been changed to the "Tottenham District Light, Heat, and Power Company." The manufacturing and distributing plant of the Company, under the supervision of Mr. A. E. Broadberry, Assoc.M.Inst.C.E., the Chief Engineer and General Manager, has been maintained in a condition of thorough efficiency.

The accounts accompanying the report show that the revenue from the sale of gas amounted to £102,832; the rental of meters, stoves, &c., and the maintenance of incandescent mantles produced £24,242; residuals yielded £30,437; and the total receipts amounted to £157,742. The principal items of expenditure were: Manufacture, £88,162; distribution, £30,211; and management, £5859—the total expenses being £139,581. The balance carried to the net revenue account is £18,161; and the total standing at the credit of this account, and available for distribution, is £59,244. As announced last week, the Directors recommend the payment of the full statutory dividends of 7⅞ per cent. per annum on the "A" stock, and 5⅝ per cent. per annum on the "B" stock. This will absorb £19,240, and leave £40,004 to be carried forward. The statements relating to manufacture show that in the half year 1,074,445,000 cubic feet of gas were made, and 977,784,000 cubic feet sold; the total quantity accounted for being 999,403,000 cubic feet.

NOTTINGHAM GAS-WORKERS' ORGANIZATION.

One of the largest gatherings of gas-workers which have been witnessed in the Nottingham district since the formation of the organization of which Mr. Will Thorne, M.P., is the administrative head, took place last Saturday night. The special purpose of the assembly was the unfolding of a new silken banner to mark the jubilee of the branch; and incidentally the proceedings presented some considerations of wide significance as to the methods of those who control the affairs of the coterie responsible for recent labour upsets in Northern counties. There has been no more profitable area for recruiting purposes to swell the coffers of the Gas-Workers' and General Labourers' Union than that which has been afforded of late years by Nottingham and its adjacent territory. But though the occasion was apparently inspiring enough for the most jaded of trade union agitators, Saturday night's proceedings in the Nottingham Arboretum Rooms fell curiously flat. It had been expected, after the diatribes attempted at the expense of the Nottingham Corporation Gas Committee, that something in the nature of a declaration of war against the local authorities was to be heard. The anticipation was apparently warranted by the circumstance that Mr. Arthur Hayday, now the President of the Nottingham Trade Council, and the whilom coadjutor of Mr. Thorne in West Ham, occupied the chair. On stereotype lines of trade union advocacy, Mr. Hayday extolled the merits of combination; Mr. Thorne following with a placid speech. But there was nothing in either of the utterances to warrant the idea that the bellicose action threatened some weeks ago against the Gas Committee, for having the courage to retain non-union hands, is likely to materialize. Leeds and other experiences seem to have served as a wholesome corrective; the firmness of the Committee presided over by the brother of the present Mayor of Nottingham having apparently convinced Mr. Thorne that he has not much chance of dictating terms to them.

THE BLACKBURN GAS STRIKE.

Blackburn has been famous in past years for its eleventh-hour settlements of trade disputes; but the strike of gas workers and other employees of the Corporation, which has extended over so long a period, will probably go down in local history as one of the most protracted—apart from certain cotton disputes—in its annals.

The beginning of the past week found the gas workers almost unanimous in their determination not to return to work on the terms offered; and the Corporation on their part, despite repeated warnings, did not seriously put into operation the threat to fill the places of the strikers, albeit many of the old employees returned to work on Monday. The officials of the Gas Workers' Union apparently interpreted this as a sign of "weakness," for our Manchester correspondent was candidly told by one of the pickets that the official attitude was "all bluff." Mr. Fleming Eccles, one of the men's organizers, had also assured the strikers that there was no fear of the strike pay running out, and expressed the view that, while the Corporation seemed determined to beat the gas workers, no matter at what cost and inconvenience to the public, the strikers were behaving with splendid loyalty to their fellow trade unionists.

Each day of the past week the strikers have paraded the principal thoroughfares of the town and suburbs in order to secure the sympathy of the public; and the men's leaders claim that the ratepayers are in favour of their demands being conceded. The result of the ballot in three of the wards, organized by the local Trades Council on the question "Are you in favour of the men's demands?" was: For the men, 3369; against, 1045. Supporters of the Corporation policy, however, hold the view that the so-called *plébiscite* is worthless as an indication of public feeling, and that it affords no guide, for obvious reasons. There are 5769 names on the burgess list for the three wards; and as only 5000 papers were distributed, a large number of people were left without. Instances, too, are forthcoming where six or seven papers were left at one house.

At a meeting of the General Purposes Committee early in the week, Mr. Gregson asked whether no report upon the situation was to be made by the Special Sub-Committee having control of the strike. The Mayor (Alderman Higginson, J.P.) referred the question to Alderman Nuttall (a member of the Special Sub-Committee), who made a general statement, and offered to answer questions. Alderman Hamer then asked why, seeing that an expert had been sent to the Hollinwood Gas-Works to report upon the conditions obtaining there in regard to work and wages, the Special Committee had taken on themselves to raise the wages of the higher-paid men, to bring them up to the Oldham standard, but had refused to bring up the labourers' wages to the same rate as that town. Mr. J. R. Hartley (Chairman of the Gas Committee) rose to reply; but Alderman Hamer objected, reminding the meeting that Alderman Nuttall represented the Special Committee. The Mayor suggested that the question was one relating to the Gas Committee, of which Mr. Hartley was the Chairmnn; but Alderman Hamer declined to accept a reply other than from Alderman Nuttall. Two resolutions followed, the first in favour of giving the labourers ½d.

an hour advance—half the amount demanded—and the other to give them 1s. per week advance. Both were voted out.

On Wednesday evening, the Trades Council ventured on a new policy, by promoting a demonstration entirely of women workers in the Town Hall. The hall was packed; and after two resolutions had been passed supporting the men's demands, and calling upon the Mayor to receive a deputation of women on the subject, the name of Alderman Nuttall was mentioned. Some excitement followed, and the women then left the building and marched (with hundreds of youths and men) to Alderman Nuttall's residence, where they made a demonstration in front of the house. The following night over 3000 people, mostly men, again marched in the direction of Alderman Nuttall's residence; but before they reached their destination they were dispersed by the police. In justice to Mr. J. R. Clynes, M.P., and other officials of the Union, it is but fair to add that the men were strongly urged not to indulge in such parades.

Political Questions at Mass Meeting.

At a demonstration in the Market Place on Thursday, organized by the Trades' Council, the following resolution was declared to have been carried unanimously: "That this meeting of trade unionists and citizens of Blackburn strongly protests against the money contributed by them as ratepayers being wasted in paying for blackleg labour, and regards the action of the Corporation as a direct insult to the organized workers of the town; further, it calls upon the Mayor to summon a special meeting of the Town Council immediately, in order that a settlement of the dispute may be arrived at; and, further, that this meeting adjourns until Monday next to see what action the Mayor takes." All the speeches were of a semi-political character; frequent references being made to the determined attitude taken by Alderman Nuttall in regard to the men's demands. Alderman Nuttall is the leader of the Conservative party; while Alderman Hamer occupies a correspondingly high position in the Liberal party.

Mr. J. Frankland, J.P., one of the Elective Auditors of the borough, desired the Borough Treasurer to allow him to inspect the accounts of the Gas Department for the last few weeks; but the Treasurer declined. He is supported in his refusal by the Town Clerk (Mr. Lewis Beard), who points out that an Elective Auditor is only entitled to inspect the complete accounts at the end of the municipal year.

At the end of last week the position of affairs offered no indication that the strike will be settled on the terms required by the strikers. Mr. W. Robinson will move at a meeting of the Council on Thursday a resolution that, "in view of the widespread dissatisfaction on the part of the ratepayers at the failure of the Corporation to come to terms with the men now on strike, a Special Committee be appointed to enter into negotiations with the representatives of the men, and to endeavour to bring the present dispute to an immediate close." It was reported on Satarday that the Corporation had a plentiful supply of labour, though few of the strikers had resumed work. The thoroughfares are better illuminated; and the town after dark is now gradually assuming its normal appearance. This daily improvement in the gas supply puzzles the strikers. Batches of skilled and unskilled workmen come and depart almost daily; but no official information is forthcoming as to the actual number of men now working at Addison Street and Greenbank. The only information vouchsafed on Saturday was that the authorities had all the men they required for the work—three of the gasholders being almost full. So far as could be ascertained in official quarters on the previous evening, the Corporation have not decided when the full supply of gas to the mills, &c., shall be resumed. It is understood that a few days ago they offered to supply gas from breakfast time until 5.30 p.m., but that, owing to some manufacturers starting to run at 6 a.m. instead of 8.30 or 9 o'clock, the offer has been withdrawn. The restricted output from the looms has seriously embarrassed many firms, apart from the loss in wages to the operatives, which, up to now, is estimated at £35,000 to £40,000.

Mossley Gas Undertaking.

The increase in the price of gas to a portion of the district now controlled by the Mossley Gas Department has brought about an unlooked-for development. For a little while past, differences have arisen between the Saddleworth Urban District Council and the Mossley authorities regarding the gas supply. The prices to all parts of the Mossley Corporation area have been increased quite recently; but it is in Saddleworth that the outcry is the greatest. Last week it was reported on good authority that the Yorkshire Electric Supply Company had offered to take over the district and promote a Parliamentary Bill, if Saddleworth consumers would promise their support. Many local folk, however, resent the proposal; and it has been pointed out that if support were given to the electric or any other outside company for electricity, the Saddleworth people would be tied on every hand. In another quarter it is suggested that a new gas undertaking should be formed for the Saddleworth district; and a meeting of the Urban District Council and some large ratepayers is suggested.

Weardale and Consett Water Company.—The net revenue of this Company for the past year, including £36,023 brought forward, amounts to £107,566. At the meeting on the 16th inst., the Directors will recommend dividends at the rates per annum of 4, 10, and 8 per cent. (less tax) on the preference and ordinary stocks; making 4, 8, and 7 per cent. for the year, and leaving £39,100 to be carried forward.

Water-Meters at Marple.—There are about 800 water-meters in the area controlled by the Marple Urban District Council, and the authority have arrived at the conclusion that many of the meters have not been registering correctly. It is stated that in some cases from 9d. to 2s. 6d. per quarter has been paid by consumers whose house-rental amounts to between £15 and £30 annually. In that case the fixed charge is 10s. per year. But, on the other hand, the accounts sent out to the cottagers in the district show that in some cases 13s. has been paid in the year. In future, however, a minimum amount will be charged for all property on which there is a water-meter; and this minimum will be demanded, no matter the amount meters register.

STAFFORD AND THE GAS SUPPLY OF COLWICH.

On Friday, the 23rd ult., an inquiry was held by Mr. R. C. Maxwell, on behalf of the Local Government Board, in regard to an application by the Stafford Corporation for a Provisional Order to extend their gas and water limits, and enable them to supply gas in bulk beyond their present area. Authority was also required for borrowing £50,000 for the gas undertaking and £10,000 for the water undertaking. The Town Clerk (Mr. R. Battle), referring to the proposed extension of the limits, said the Corporation had been approached to furnish a supply of gas to the parish of Colwich; but they could not do so, as the place was outside their area. The Stafford Rural District Council and the Colwich Parish Council were in favour of the Corporation's application. The Rugeley Gas Company had powers of supply at Colwich, but had not exercised them; and in order to do so they would have to extend the existing mains for eight miles. Those of the Corporation, however, were already laid to within a few hundred yards of the boundaries of Colwich, and they would consequently be in a position to furnish a supply of gas at once. With regard to the further borrowing powers applied for by the Corporation, they estimated that £50,000 of capital would be needed in the next twenty years, in addition to their unexercised powers to the amount of £13,700. The Gas Engineer to the Corporation (Mr. W. M. Valon) said within the next five years a sum of £28,000 would be required for alterations. The cost of extending the mains to Colwich would probably be from £2500 to £5000. Mr. H. Gardner, on behalf of the Rugeley Gas Company, said there had never been any application to them to supply any portion of the parish of Colwich with gas. When it came, it would be considered. The Company were in quite as good a position to supply the parish as the Corporation were, as they were only 3½ miles distant. The Company would probably extend their mains within a reasonable time; and he submitted that until it had been shown that they had failed to comply with any requirements made upon them, the extension of the Corporation's powers should not be granted.

BARROW-IN-FURNESS GAS-WORKS EXTENSIONS.

A £75,000 Scheme.

At the Barrow Town Hall, last Wednesday week, there was held a Local Government Board inquiry, by Mr. F. O. Stanford, into an application by the Corporation for the issue of a Provisional Order under sections 297 to 303 of the Public Health Act, to "partially repeal, alter, or amend Special Acts of 1868, 1872, 1873, and 1875, to empower the Corporation to acquire 7½ acres of land, and to obtain certain other powers." The Corporation also sought sanction to borrow the sum of £75,000.

The Town Clerk (Mr. L. Hewlett), in putting the case before the Inspector, said the powers which the Corporation desired were as follows: (1) To acquire and use for the manufacture and storage of gas and residual products a piece of land comprising 7½ acres or thereabouts, situate in the borough. (2) To confirm the use by them for the manufacture and storage of gas and residual products of certain specified lands. (3) To empower them to require consumers of gas to use effective anti-fluctuators or other apparatus for controlling and regulating the supply of gas to engines. (4) To require consumers of gas to give notice before quitting premises supplied with gas by meter. (5) To make provisions with regard to notices from the consumers for the discontinuance of a supply of gas. (6) To empower the Corporation to refuse to supply gas to persons indebted to them in respect of a supply of gas for other premises. (7) To confer further powers with respect to the erroneous registration of gas by defective meters. (8) To exempt the Corporation from liability to a penalty in certain cases on account of insufficiency of pressure, defect of illuminating power, or excess of impurity in the gas supplied by them. (9) For the several purposes of the application, or for the purposes connected with, incidental to, or consequent on, these purposes, to make any such alteration or amendment of the Local Acts named, or any other Local Act, or of any Act confirming a Provisional Order made in pursuance of any of the Sanitary Acts or of the Public Health Act, 1875, in force in the borough, and to borrow, with the consent of the Local Government Board, the sum of £75,000 for the purchase of land, and the erection of gas-works thereon. He said that, when the works were first acquired, they covered about 1½ acres; and since then there had been large additions and alterations to meet increasing demands. In 1899 and 1905 additional lands were purchased. Since the undertaking was acquired, three additional gasholders had been erected; and in 1903 a water-gas installation was put down to act as a stand-by. The present works covered 2½ acres; and the capacity was insufficient to meet the present and anticipated immediate future demands. The town had grown very rapidly in the past few years, and was still growing. In 1901 the population was 57,586; and it was now estimated at 68,000. The number of consumers in 1903 was 8037, as compared with 12,033 at present. The income from the sale of gas had gone up from £23,534 in 1903 to £42,006 in 1913. The maximum daily consumption was 1,386,000 cubic feet. The capacity of the existing works was: Coal-carbonizing plant, 1,250,000 cubic feet per day; water-gas plant, 500,000 cubic feet per day. The purifying plant was capable of dealing with a daily make of 1,000,000 cubic feet of coal gas; and the three gasholders had a combined capacity of 1,385,000 cubic feet. It would be seen, therefore, that the plant was inadequate. An agreement had been entered into provisionally with the Furness Railway Company for the purchase of land which was freehold; and this contained no restrictions in the legal sense, though there were certain clauses as to level crossings. The land was conveniently situated for obtaining railway access. It was some way out of the town, and at present there were only twenty-four dwelling-houses within a radius of 300 yards. It was proposed to erect plant for the production of 500,000 cubic feet of coal gas per day; and arrangements had been made to extend as required to 3,000,000 cubic feet.

Evidence as to the need for the extensions having been given by

Mr. A. Brown (Deputy-Chairman of the Gas Committee), it was pointed out on behalf of the local Chamber of Trade that it would be advisable to have a more definite wording of the clause dealing with erroneous or defective meters. It was agreed to insert in the clause words to the effect that any defect discovered should be deemed to have arisen in the quarter immediately preceding the discovery. In the course of his evidence, the Gas Manager (Mr. W. Fergusson) said that in the new works both coal gas and water gas would be manufactured, as at the present ones. There had been a steady increase in the gas consumption for the last ten years. Personally, he did not see any objection to gas-works being near dwellings. There might be an element of smell; but he did not consider this injurious to health. With vertical retorts there was less smell. In fact, in modern gas-works really the only smell was when a purifier was being emptied. The Borough Surveyor (Mr. A. Race) said the Committee had selected their plant not only from the gas-making point of view, but also with a view of preventing the possibility of any nuisance arising. He did not think the proximity of the gas-works would in any way affect the health of the inmates of the workhouse or the infirmary. Alderman Hardy remarked that some of the finest trees the Corporation grew were near to the gas-works. Dr. Orr (the Medical Officer of Health) also expressed the opinion that the proximity of the workhouse would not have any injuricus effect on the health of the inmates of it.

Mr. Taylor addressed the Inspector in opposition, on behalf of the Guardians, who objected to gas-works being erected within 150 yards of their buildings. One ratepayer (Mr. Ashburner) also opposed, on the ground that the Council's financial commitments were already sufficiently heavy; while another (Mr. Spencer) asked that there should be inserted in the Order some clause limiting the proportion of carburetted water gas to be sent out.

At the close of the inquiry, the Inspector viewed the proposed site.

A YORKSHIRE AMALGAMATION SCHEME.

A Committee of the West Riding County Council last week held an inquiry into a proposal to amalgamate the Cleckheaton, Gomersal, and Liversedge urban districts. Alderman P. H. Booth presided.

The case was presented by Mr. J. Vesey Knox, K.C., who appeared on behalf of the three Councils. In the course of his speech, he said it was to the credit of the districts that they had been able to unite. They had not done so without difficulty; and their union had not always been quite peaceful. If the present application were rejected, friction would continue. As to the water supply, it all came from Bradford. Liversedge was within the Bradford area of supply, and under a recent Act had the advantage of the Bradford prices. Cleckheaton took Bradford water in bulk for itself and for part of Gomersal. The debt on the Cleckheaton water undertaking, which only included distributing works, was entirely paid off; and all capital expenditure and new services were met out of revenue. Under the amalgamation scheme, it had been agreed that the prices and conditions of supply were to be the same at Gomersal as at Cleckheaton; and therefore, from the Gomersal point of view, the amalgamation offered considerable advantages. There was no intention of altering the rights of Bradford in any way. Cleckheaton was authorized in 1870 to supply gas, and had works supplying 138 million cubic feet a year. The area of the Cleckheaton gas undertaking was not the same as the Cleckheaton district. A part of Cleckheaton was in the Bradford gas area. There was a special purchase clause in the Bradford Act; and Cleckheaton was during the coming session promoting a Bill in Parliament for the purchase of this portion of the Bradford undertaking. Cleckheaton gave a supply in parts of Liversedge and Gomersal; and these parts had been contributing to the large profit which Cleckheaton had made out of its gas undertaking. This undertaking had been in existence for something like forty years, and was in a very favourable position; the profit last year being £3865, or equal to 1s. 4d. in the pound on the Cleckheaton rates. Of the £53,000 borrowed capital, only £15,000 was now outstanding. It was not a common thing for a local body possessing a property of this value to be willing to share with its neighbours on equal terms.

LEIGHTON BUZZARD GAS-WORKS.

Purchase Bill to be Promoted.

A Special Meeting of the Leighton Buzzard Urban District Council was held on the 22nd ult., at the request of the Lighting Committee, in connection with the Bill to secure extended powers which the Gas Company are promoting in the forthcoming session of Parliament. There was a good deal of discussion; but it was more with reference to the advisability of purchasing the gas-works than on the subject of the Company's Bill. It was announced that Mr. Baker (Parliamentary Agent) was in attendance; and eventually it was decided that his statement should be taken in committee.

As the result of what transpired on this occasion, a further meeting of the Council was held on Monday of last week to consider the question of purchase, which, as a local paper remarks, had "with dramatic suddenness become a burning one." The resolutions submitted were: (1) "That the Council, having considered the provisions of the Bill which has been deposited in Parliament by the Leighton Buzzard Gas Company, are of opinion that, in the interests of the town, they should exercise the option to purchase the undertaking given them by the Leighton Buzzard Gas Act, 1891." (2) "That the Clerk be instructed to take all necessary steps for depositing a Bill in Parliament for this purpose during the session 1914." (3) "That Messrs. Baker and Sons, of Westminster, be retained as Parliamentary Agents, and Mr. E. H. Stevenson as Engineer."

Mr. Stevenson, who was present, made a lengthy statement, in the course of which he said that there were in the Company's Bill one or two remarkable clauses. Parliament had never yet been asked to pass a clause such as was suggested, that the Company should pay back-dividends out of the reserve fund, and should pay bigger dividends by becoming a sliding-scale company. Whether they acquired the Company or not, these clauses should be altered. The Company were also not asking Parliament to put upon them the stipulation that they should not carry forward large sums of money. As to the question of purchase, the position was unusual. The Company could not oppose the purchase; they could only oppose an offer of purchase on unfair terms. As the purchasers, the Council must expect to pay a little more than the market value of the shares. In most companies of this kind, one could invest to get about 5¼ per cent. The Council could not buy on these terms, as the shareholders would have to be paid out on terms which would enable them to make an equally good (if not better) investment of the same kind elsewhere. He thought the Company were right in asking for a calorific test instead of a lighting power test. As to the terms of purchase, the highest that had been given in recent years was 22 years' purchase of the dividends. The dividends last year were £1893; and at 22 years' purchase, the price would be £41,646. They could borrow money, including interest and sinking fund, at 5 per cent., which would be £2100 per annum. The profits last year were £2050. If the Council purchased the undertaking, he believed, in view of the figures available and the savings that were possible, the time would come when the capital would be paid off, and there would be no dividends to meet. The managing expenses of the Company were higher than those of any company he knew. In 1912, £1259 was spent chiefly in Directors' fees and salaries. If the undertaking went ahead, it could be run with a saving of £500 on repairs, &c., and £700 on management. The Bill might cost £600, and the arbitration £2000; but even with this added, they did not stand to lose. Few companies of the kind of that at Leighton Buzzard had been taken over by local authorities during recent years. The Company were likely to get more by agreement with the suggested purchasers than through arbitration. Generally speaking, in cases where local authorities had adopted an electric light scheme in opposition to the gas company, the effect upon the gas company had been very small. He considered the purchase of the gas-works by the town would be a distinct financial gain to the consumers in the immediate future. The undertaking was a very profitable one, and could be made much more so.

The resolutions were carried; the Chairman (Mr. J. Payne) expressing the hope that, if the Bill went through, Mr. R. Richmond (who is a councillor and the Chairman of the Gas Company) would accept the position of Chairman of the Gas Committee.

The following facts about the undertaking were published in the issue of the "Leighton Buzzard Observer" which contained the reports of the Council meetings.

At the annual meeting of the Company in February last year, the accounts showed a net profit on the year's working (after paying £261 for Directors' fees and allowances), of £1993. A dividend of 10 per cent. and £1 10s. bonus was paid on the original stock, and 7 per cent., with 21s. bonus, on the new ordinary stock, which absorbed £2050, thus reducing by £57 the balance carried forward. The issued capital of the Company consisted of £12,106 of original stock, and £9750 of new ordinary stock, and for the latter £3251 had been paid in premiums—thus making a total of £25,107. The market value of the stock at the present time is about £40,000—probably a little over. Against this, the total net expenditure on capital account has been £25,535; so that the difference between this sum and £40,000 is composed of undistributed profits and goodwill. During the year 1912, the sales of gas reached £7269, for 49,418,000 cubic feet sold to ordinary consumers; and £689, for 4,176,000 cubic feet used for public lighting. No less a sum than £3265 was derived from the sale of residuals (chiefly coke, £2337); £845 came from rental of meters and stoves, and the sale of sundries; and £7 12s. was obtained from rent. The total receipts were £12,077. Against this, coal cost £4900, wages and salaries, £1162, other salaries and fees £1258, rent, rates, &c., £344, and public lamps repairs £194; while £222 was carried to fittings account. Roughly, therefore, the Company sold £8000 worth of gas, and £4000 came from coke, meters, &c. They spent £5000 on coal, £5000 on wages and expenses, and had a balance of £2000.

The early years of the Company were very lean ones for the shareholders; and at one time the prospects were very gloomy indeed. Some thirty years ago, the late Mr. C. F. Ruggles became Manager; and, with the hearty co-operation of the Directors, he gradually remodelled the whole concern. When the present site was bought, the sand on it was worked on terms which, it is currently reported, paid for the land; and since that time the Company have had the benefit of this considerable sum. The works at the present time are among the best equipped in the country for their size; and the utmost care is taken to see that there is no unnecessary handling of the coal, or waste of materials. The consumption of gas has been fostered in every possible way—especially for heating; and the price has been gradually reduced until at the present time it is 3s. per 1000 cubic feet to ordinary consumers, down to 2s. for large power users. It is claimed that no town of the same size in the country, equidistant from a coalfield, gives better terms to the public.

Mr. H. G. Ruggles is now Secretary and Manager of the Company.

Referring to the recent coal strike, "The Times" last Wednesday said: "As usual, it is the people of the strikers' own class who have suffered most from their cessation from work. To some extent the hardship suffered by the poor has been mitigated by the resort to the gas companies' yards for coke. The South Metropolitan Company in this way sold 800 tons of coke in 28 lb. paper bags. Middle-class consumers have met the situation by a greater use of gas-fires. The strike has been too short to cause many people to purchase gas-fires; but the fear that this policy would be largely adopted, and permanent injury done to their trade as a result, has been constantly in the minds of the coal merchants."

DUBLIN GAS COMPANY'S ELECTRICITY BILL.

Opposition of the Corporation.

A Special Meeting of the Dublin Corporation was held last Tuesday, for the purpose of considering the question of opposing the Alliance and Dublin Consumers' Gas Company's Electric Supply Bill.

In a letter addressed to the Council, Mr. H. Campbell (Town Clerk) said he was advised by the Law Agent that the provisions of the Bill would require close examination and watching, in order that there might be no loss to the citizens. Clauses safeguarding from injurious interference the water-mains of the Corporation in the district covered by the Bill must be looked for; so that better protection than that afforded by the Bill might be obtained. Section 16 of the Company's Act of 1909, it was pointed out, made the price of gas and the dividends of the Company interdependent; and consequently any loss on the new electric undertaking which would reduce the dividend of the Gas Company would tend to keep up the price of gas in the city, to the disadvantage, not only of the city, but of the Corporation. Furthermore, if the Bill passed in its present form, it might be taken to be a parliamentary declaration that the Company had power to supply electricity in all the gas area, including the city of Dublin, and thus to compete with the Corporation in the supply of electricity. A petition to Parliament was, therefore, necessary; and he suggested the passing of a resolution authorizing the Bill to be opposed on behalf of the Corporation.

The Lord Mayor (Mr. Lorcan Sherlock, LL.D.), in moving the resolution, said he did not think the question was one that required labouring, as it was the duty of the Corporation to protect the interests of the citizens. If the Bill was not defeated altogether, they were at least bound to secure such clauses as would effectively protect their interests.

Alderman Farrell said this step would inconvenience the Gas Company very much. He recalled that they had a big fight in the House of Lords a few years ago, to prevent the Company increasing the price of gas, and urged that the Corporation ought now to try and restrain the Company from enforcing the increase of 2d., which, as anyone knew, was an infringement of the powers conferred on the Company three or four years ago. It was the duty of the citizens to safeguard their own electric lighting undertaking.

Alderman Quaid regretted that a step of this sort should be taken without something formal being put before the Council; but he admitted that there was essential urgency to justify immediate action. It was, in fact, desirable that they should defeat the Bill, if it was inimical to the interests of the citizens. He referred to the increase in the cost of electricity under the Corporation, and said the Gas Company, in his opinion, had good business justification—by the Electricity Committee of the Corporation—in projecting the Bill. At present, the Corporation had a monopoly of the sale of electricity for both public and private consumption; and citizens might ask whether it was fair that such a monopoly should exist. He would like to see an impartial Committee appointed to consider the whole question.

Alderman O'Reilly thought it was beyond comprehension that there should be any debate on the issue as to opposing the Bill. The citizens had invested their money; and they were entitled to protection.

Mr. J. T. Kelly also did not think there could be two sides in a matter of this kind. Three-quarters of a million of the ratepayers' money had been invested in the Corporation undertaking; and it was their duty to conserve the interests thus involved. For his part, he would be glad if some arrangement could be come to with the Gas Company whereby the whole thing could be run for the benefit of the citizens.

Mr. Partridge drew attention to what he considered "the dangerous quality of gas" supplied in the city, and asked whether it would be possible, in connection with the Bill, to compel the Company to supply gas that would be less dangerous to the citizens.

Alderman M'Carthy thought that the last opposition to the Gas Company might have produced better results.

The Town Clerk said the opposition to the previous Bill of the Company cost himself and the Law Agent a good deal of anxiety. The price of gas had been enormously reduced; and the amount from year to year, if capitalized, would run a very big concern. The city had benefited greatly.

Alderman M'Carthy: I do not see it.

The Town Clerk: The gas may not be so good; but you are getting the same gas as places like Warrington and Manchester.

Alderman Farrell said before the last Gas Bill, the added areas under the city extension scheme paid 4s. 10d. per 1000 cubic feet; and, as a result of the opposition, they had paid ever since (up to about a month ago) 3s. 4d.

Mr. Partridge said that, while it was admitted that the price had been reduced, owing to the quality of the gas they burned more now; and the gas was, accordingly, more expensive.

The resolution was carried unanimously.

The Blackrock Urban District Council last Wednesday also resolved to oppose the Gas Company's Bill. The Law Agent (Mr. C. P. O'Neill) went into detail regarding the agreement between the Council and the Company. This document, he said, was not signed and sealed, and its clauses were not incorporated in the Bill. This provided for overhead cables and wires; whereas in the agreement wires were only to be allowed in certain places. In his opinion, the Bill was a long way from carrying out the agreement. Mr. Good said the Company had repudiated the agreement, and the whole Bill ought to be opposed. A Committee was then appointed to confer with the Law Agent and Council as to the form of a petition to be presented against the Bill.

After two hours' deliberation on Thursday last, the Kingstown Urban District Council unanimously decided to oppose the Gas Company's Bill, while Mr. M. F. O'Brien handed in notice of motion to rescind a resolution supporting the Dublin and Southern Districts Electricity Supply Bill, promoted by an independent Company, and seeking also to have it opposed in Parliament.

BIRMINGHAM AND MUNICIPAL TRADING.

The Supply of Gas-Mantles.

At the Meeting of the Birmingham Chamber of Commerce last Wednesday, the Imperial and Local Finance Committee reported that they had further considered the matter referred to in their previous report with reference to the supply of "Standard" gas-mantles by the Corporation and the advertising slip with reference thereto attached to the gas accounts [see "Journal" for Dec. 23, p. 964].

The Committee were informed that, with the object of supplying an efficient incandescent gas-mantle, an arrangement was entered into some time ago between the Gas Committee and the Master Gas-Fitters of the city for the purchase of mantles in bulk. Tenders were invited from a number of manufacturers of mantles, and they were asked to send in samples of their productions. These samples were then tested by analysts employed by the Corporation, and those of three manufacturers were selected as being the most efficient. The three makers are well-known firms; but the mantles supplied as "Standard" mantles to the Gas Committee and to the Master Gas-Fitters did not bear the manufacturer's name. A contract was entered into with them for the supply of mantles in bulk for the period of one year; and the Committee understand that before this contract expired the three firms now supplying "Standard" mantles, and other firms who were manufacturers of these goods, would again be invited to compete, with the view of a similar contract being made for a further period of one year.

Notwithstanding this explanation, the Committee were not satisfied as to the wisdom of the policy adopted by the Gas Committee in regard to the matter, especially as some of their members had experimented with the "Standard" gas-mantles and had stated that, in their opinion, they were no stronger nor more durable, and gave no better lighting results, than other mantles which might be purchased in the open market at a lower price. The Committee proposed, however, to suspend their final judgment until the period of the present contract expired.

GAS PUBLICITY IN COVENTRY.

Subscription to the B.C.G.A.

A proposal to contribute £125 annually to the British Commercial Gas Association led to an interesting discussion by the Coventry City Council. The Gas Committee had decided in favour of this yearly subscription. Councillor A. White, the Chairman of the Committee, remarked that the amount might at first seem large, but there are something like thirty or more gas undertakings in the country that had been subscribing and were doing so to-day at the same rate as was suggested for Coventry. He strongly advocated the course that was being taken, pointing out that there were methods of dealing with gas which he feared were not sufficiently understood by some people, and it would be advantageous to make the uses of gas more widely known. It was firmly believed that the Department would benefit considerably by the course proposed in promoting the greater use of gas appliances and by the increased sales of the gas that they were producing in Coventry. Councillor A. C. Bannington, in moving that the Committee's minute be referred back, argued that the £125 could be more usefully expended in having an exhibition for the benefit of Coventry people. He suggested that the Chairman of the Gas Committee and the Chairman of the Electric Light Committee should consider whether an exhibition might not be arranged in order to demonstrate the uses of both gas and electricity to the citizens. Councillor W. H. Halliwell seconded this. He said he gathered from the Chairman of the Gas Committee that there were thirty towns in the United Kingdom that were subscribing to the Association named; and if this were so, there must be many more that did not subscribe. Why Coventry should contribute £125 a year for the benefit of other parts of the kingdom he did not quite see. He was of the opinion that the money could be more profitably spent locally.

Councillor S. G. Poole expressed himself in similar terms. In Coventry both the gas and electricity undertakings were municipal concerns; and it seemed to him that to spend £125 in advertising the advantages of one over the other was a waste of public money. The outlay would be better if devoted to an exhibition in their own city showing the utility of both gas and electric light. He saw no reason why both the Gas and the Electric Light Committees should not have a permanent exhibition in the city that would serve to demonstrate to the citizens what the departments were prepared to provide in the way of economical and effective use of each product. Alderman W. H. Batchelor, a former Chairman of the Gas Committee, supported the Committee's recommendation on the ground that the money would be well spent. The Association had for some time been bringing before the public the advantages of the use of gas both for lighting and heating, as well as for commercial purposes. Gas was finding its way commercially into a variety of industries, and its use was increasing daily. Part of this was due to the Association; and they were anxious to continue their work. He emphasized the point that most gas undertakings that were privately owned and also limited liability companies subscribed in the manner it was proposed to do here. They saw the advantage of it, and if it was a benefit to private undertakings, why should it not be so to a corporation? Manchester and a number of other towns had subscribed according to the scale. Coventry ought to do likewise, for they would be getting value for their money. Councillor H. W. Wale was in favour of a local exhibition, which would enable the people to judge for themselves what was best. Councillor Lee, the Chairman of the Electric Light Committee, spoke in support of the Gas Committee's proposal as a means of educating the people as to the benefits of the product they had to offer. He trusted that in their trading concerns facilities would be given for spreading knowledge in this way. Councillor W. Jones also supported the recommendation, which was adopted by a large majority.

STRANGE EXPLOSIONS IN BRADFORD.

An "Absolutely Unique" Occurrence—Is It Natural Gas?

[From the "Yorkshire Post," Jan. 29.]

There was a curious phenomenon in Bradford last night, which caused consternation among residents in the Manningham district, and within a radius of about a quarter-of-a-mile people, even until the early hours of the morning, were afraid to go to bed. Queer rumbling noises and intermittent explosions were heard in various parts of the district; and in some instances the residents were still further alarmed by tongues of blue flame arising from the hearthstones in their houses. The first of the series of explosions took place about 6 o'clock at No. 32, Laburnum Street, which is occupied by Mr. G. Hall. The occupants were startled by a loud report in the cellar, and on going down stairs to investigate, it was found that a cellar window had been blown out, the plaster stripped from the walls, and that flames were issuing from between the flags. The City Fire Brigade, under Chief Officer Scott, was summoned; but their services in this instance were not required. They had only just returned to the fire station when they received another summons to the same district—this time to No. 14, Wilson Square, which is only a short distance from Laburnum Street. The occupier of this house is Mrs. Emily Armstrong; and while about her household duties, she was alarmed to hear subterranean explosions, and several flags of her kitchen were blown into the air. Flames made their appearance; but they died away in a short time.

The suspicion when the first outbreak took place was that there was an escape of ordinary coal gas from one of the mains; but the second fire tended to dispel this theory. News of the two happenings had been noised abroad, and the people in the neighbourhood were already becoming somewhat uneasy. Their fears were still further strengthened when, shortly after 9 o'clock, there was a third explosion, accompanied by flames—this time at the house of Mrs. E. Bond, No. 27, Carlisle Terrace. A young man named Whitehead, who was lodging with Mrs. Bond, was sitting by the fireside in the kitchen reading a newspaper, when a sheet of flame about 10 feet high rose in front of him. Thinking this was caused by the coal, he commenced poking the fire; but to his astonishment he found that the flames were not coming from the fire, but from between the hearthstones. Once more the City Fire Brigade paid a visit to the district; but when they reached the scene the flames had vanished.

While the firemen were at Mrs. Bond's house, they were informed that flames had broken out next door—No. 29, Carlisle Terrace—where Mr. E. Exley and his family reside. One of the sons was sitting by the fireside when a somewhat severe explosion took place. Some dusters which were hanging on the line by the mantelpiece were blown across the room, and again blue flames shot up from the hearthstones. But they did not subside as they had done in the two previous cases; and when our Bradford representative early this morning visited the house the flames were coming as strongly as ever from the floor, and the firemen could only stand by helpless and watch them. In all three cases the floors of the kitchen were of stone. The hearthstones of No. 29 were so hot that in several places they were badly cracked. Seeing that their efforts would be futile, the brigade again returned to their headquarters, leaving a few firemen to keep watch.

About 10.30, the alarm bell was once more heard, and the Manningham district was again the destination of the brigade. The fifth occurrence was much more serious than the former ones; and here they were called upon to deal with a fire at No. 58, Southfield Square, the residence of Mr. and Mrs. Sunhill. Mrs. Lund, who lives at No. 57, Southfield Square, was disturbed by curious rumblings below her house; and, with the assistance of Mr. R. D. Steele, she made investigations, but could find nothing to account for the noises. Later Mr. Lund visited the house of Mr. Sunhill next door. The tenants were out; but Mr. Lund noticed a glow through one of the windows. Mr. Steele and Mr. Lund eventually found that a fire was in progress under the floor of the house; and the brigade were summoned. When the firemen opened the door of the dining-room, the whole place burst out into flames, and the fire burned fiercely for about an hour. The room was gutted; the damage being estimated at about £200. Mr. Steele, who, as a chemist, is qualified to express an opinion on the matter, believes that the cause of the outbreak is marsh gas, which has, consequent on recent borings in the vicinity, found its way up to the foundations of the houses. Some of this gas must have come into contact with the fires in the houses—hence the remarkable occurrences of last night.

Chief-Inspector Scott told our representative that the occurrence was "absolutely unique" in his experience; and he could only account for it by the natural gas theory.

There were further slight explosions on Thursday morning. As a matter of fact, they have been taking place for some little time past; and the officials of the Gas Department have been overhauling the mains in the neighbourhood, with a view to ascertaining whether an escape from them was responsible for the disturbances. The investigations proved, however, that there was no possibility of this being the case. Professor Kendall, who has gone thoroughly into the matter, says that there is no doubt the rocks below the soil are charged with gas from some local source, possibly deep-seated, and the gas may be finding a local vent. He believes it is mainly marsh gas, perhaps coming from beds of coal. He urges the necessity of efficiently ventilating the cellars.

Electric Light Failure at Bridgwater.—A remarkable incident occurred at Bridgwater on the evening of Sunday, the 25th ult. The electric light became suddenly extinguished during the course of the service at Holy Trinity Church, and the Vicar (the Rev. E. De St. Croix) preached an extempore sermon for half-an-hour in complete darkness. At the conclusion of the service the worshippers left by candle-light; but, as they were passing out of the churchyard, the electric lights were switched-on again.

MR. CHARLES ARMITAGE'S RETIREMENT.

In presenting the minutes of the Gas Committee at the meeting of the Lancaster Town Council last Wednesday, Alderman Sir N. W. Helme said the Committee had passed the following resolution:

> "That this Committee desires to place on record its hearty appreciation of the skill, high integrity, fidelity, and consistent attention to his duties which Mr. Armitage has shown during the whole period of his service, and which has resulted in placing the undertaking of the Lancaster Corporation in the forefront of gas undertakings in the country; and that this Committee expresses a hope that his life may be long spared to enjoy his retirement and render service as Consulting Engineer."

The Committee, he went on, desired the Council to confirm this resolution. It had been his (Sir Norval's) pleasure, during the 24 years he had served on the Council, to be a member of the Gas Committee; and next month he would complete 19 years' service as Chairman. He had thus been brought into close contact with Mr. Armitage, and he desired to testify to the thoroughness of his services. They had had a most successful management of the undertaking. When Mr. Armitage took charge, the quantity of coal carbonized was 5000 tons, and now the total was 22,000 tons; while the gas made had increased from 55 to 230 million cubic feet. The cost of the gas in 1881 was 2s. 0½d. per 1000 cubic feet, and now it was 7·91d.; while the price received in 1881 was 3s. 11½d. per 1000 feet, and now it was 1s. 11d. The capital of the works was now £111,849, a small increase of £18,065. Yet they had quadrupled the producing power out of profits. This was a record of which any manager might be proud.

Several councillors added their testimony, and the minutes were passed.

ENGINEERING BUSINESS IN THE PAST YEAR.

The Engineering Supplement to "The Times" last Wednesday was of an unusually interesting character, as it consisted mainly of a review of the engineering progress during the past year. One section contained reports furnished by most of the principal firms; and the following particulars are extracted from those which specially concern "JOURNAL" readers.

The Bonecourt Surface Combustion Company, Limited, report that during last year the development of surface combustion with steam-boilers was chiefly in the direction of increase in the size of boiler units, and additions to the kinds of fuel for which this principle can be utilized. In the first instance, boilers were fired with town and coke-oven gas; but the commercial possibilities of use with gases of lower calorific value—such as Mond, producer, and blast-furnace gas—open a much larger field. Small-scale experiments have been carried out to ascertain the best conditions for working surface combustion with Mond gas; and a boiler of 2000 lbs. per hour evaporation was installed at the works of an important manufacturing company in the Midlands. In consequence of this and other developments which have taken place at the Bonecourt Company's works at Streatham, the Company decided to instal two large boiler units of 11,000 lbs. evaporation each to supply the steam required in their recovery producer-gas plant. These boilers are now under construction, and will be completed in the early part of the present year. The Bonecourt system has also been developed for use with liquid fuel, and it has been shown that the same high thermal efficiency that is obtainable with gaseous fuel can be secured with crude oil. To demonstrate the practical working of surface combustion with liquid fuel, a large boiler of some 4000 lbs. per hour evaporative capacity has been installed at the Company's works; and though it has been in operation for only a short time, the performance at the trials so far is stated to have been entirely satisfactory. Efficiencies of over 90 per cent. have been obtained, with a rate of steaming of over 20 lbs. per square foot of heating surface. Bonecourt furnaces have been installed in various parts of the country for annealing, hardening, and tempering, as well as for the melting of metals. In an annealing furnace for heating copper and brass rods and tubes erected at a large works in Birmingham, the gas consumption in continuous running has been between 80 oand 900 cubic feet of town gas per hour—the working space being 12 feet by 3 feet and 15 inches deep.

The Coal Distillation Company, Middlesbrough, completed last year 64 waste heat coke-ovens with direct process bye-product plant for the recovery of tar and sulphate of ammonia, and also crude benzol plant for the North Brancepeth Coal Company, at Littleburn Colliery, near Durham, together with a crude benzol plant to work in conjunction with 50 coke-ovens for Messrs. J. & G. Wells, at Holbrook Colliery, near Sheffield. They are at present constructing a number of Collin regenerative coke-ovens, with direct process recovery of tar and sulphate of ammonia, with crude benzol plant, and waste heat coke-ovens, with bye-product plant for the recovery of tar, sulphate of ammonia, and crude benzol.

The Coke-Oven Construction Company, of Sheffield, installed and put into operation last year new plant for the direct recovery of ammonia at Beighton Colliery, near Sheffield. Formerly the gases were scrubbed with water and weak ammoniacal liquor, and on distillation of this liquor a 16 per cent. concentrate of ammonia was produced; but now the ammonia is recovered as sulphate. The second of two batteries of 48 ovens of the regenerative type was started early last year at Normanby Park Works, Lincolnshire, and several minor extensions at other plants. The 40 ovens built at the Dean and Chapter Colliery, County Durham, in substitution for a battery of 60 Coppée recovery ovens (pulled down), were successfully put into operation in June. The Broken Hill Proprietary Company placed with the Company an order for an important installation of Semet-Solvay coke-ovens for New South Wales. In the first instance, about 350 tons of coke a day will be produced; but this quantity will soon be trebled. The ovens are of the regenerative type, and the ammonia will be recovered as sulphate by the direct process. The coal, derived from the Newcastle district, contains about 35 per cent. of

volatile matter. Work has been started on the foundations for an installation of Semet-Solvay ovens at Hoyland Silkstone Colliery, near Barnsley, including a coal washery, power-house, and other subsidiary plant. The quantity of slack to be coked in the first instance is about 2000 tons per week; and it is intended to use an oven of a capacity approximating to the large units familiar in the United States. The ammonia will be recovered by the direct process, and a benzol plant will be included.

Messrs. R. & J. Dempster extended their works last year in order to enable them to deal with the manufacture of plants for the production of hydrogen, acetylene, and water gas; and they have further developed a welding-machine for use with these gases. The firm say the prospects for the use of gaseous fuel are very encouraging; and the application of mixed gases for commercial purposes—welding, heating, and power, and the treatment of oils—is largely on the increase.

Messrs. Robert Dempster and Sons were kept exceedingly busy last year. Notwithstanding the fact that they have built a new three-bay fitting shop two-and-a-half times the area of their old shop, and that their gasholder and plate-working and structural steel departments have been considerably enlarged, they had to work overtime for the greater part of 1913. Their outlook for the present year appears to be bright. The work done consisted of gas plant work generally, mono-rail telphers, conveyors for handling coal, coke, and ores, horizontal retort installations with stoking machinery, and a large number of spiral-guided gasholders and steel tanks. They completed for the Oldham Corporation the largest four-lift spiral-guided gasholder in the world, having a capacity of about 5½ million cubic feet—making the fourth four-lift gasholder of this kind they have made for the Corporation. [This holder was described in the "JOURNAL" for the 3rd of June last.] They are completing a bye-product plant in connection with a bench of 50 coke-ovens for the Powell Duffryn Steam Coal Company's Bargoed Colliery, including all oven fittings.

The Dowson and Mason Gas Plant Company had a busy year on the gas power side; and they are fully engaged with orders for the Moore water-jacketed gas-producer with bye-product recovery. Their works are to be extended.

Messrs. W. J. Jenkins and Co. had to employ a night shift during a considerable period of last year. As "JOURNAL" readers are aware, they specialize in labour-saving machinery in connection with gas-works and coke-ovens; and with the prevalence of labour troubles it is anticipated the demand for this plant will continue to increase.

Messrs. George Kent and Co., Limited, state that the volume of business in the supply of meters for the measurement of water and air was fully maintained during 1913; and considerable progress was made with both steam and gas metering. An interesting installation, which affords an instance of the elasticity of the application of the Venturi meter, consisted of three sets of apparatus intended for a group of mines in the East. Three mines have a common reservoir situated at a considerable distance. The problem was to assure an equal division of the water without laying separate pipe-lines from the reservoir to the mines, which are at levels that differ considerably. A common main was brought to a point roughly equi-distant from the three mines, and equity of division is assured by the Venturi control gear; a record being given in addition of the actual rate of flow passing to each mine together with a registration of the total consumption by each.

The Koppers' Coke-Oven and Bye-Product Company experienced much trouble in erection work last year owing to labour difficulties, which caused considerable delay in the delivery of the necessary material. They completed a large number of plants, and have on hand many others which they expect to finish during the present year. Orders have been received from the Birmingham Corporation for a further battery of 54 chamber ovens to be erected at the Saltley Gas-Works for the production of 6 million cubic feet of gas per day; from the Yorkshire Coking and Chemical Company, Castleford, for 120 regenerative ovens and bye-product plant for tar, ammonia, and benzol; and from the North Bitchburn Coal Company for a benzol plant.

The Lead Wool Company report an increased business with lead wool and kindred manufactures during 1913. The extension of the distribution of gas under high pressure for heating and lighting has brought lead wool into prominence among gas engineers. On a long length of 4-inch and 6-inch steel mains jointed with this material, a test of 60 lbs. of compressed air was applied for a period of six days and nights; but it is stated that no leakage whatever was recorded. In connection with the new water-works for Lagos, in Southern Nigeria, some 22 miles of 28-inch pipes will be jointed with lead wool, and the caulking is being carried out with Stevens's pneumatic hammers.

Messrs. Thomas Piggott and Co. report a full order book, which was maintained throughout the past year in all departments. They recently added to their works a hot galvanizing plant, the installation of which has been justified by the output. Orders from Government departments, railways, and other companies, and their usual trade in welded and riveted steel pipes, were fully up to the average last year.

The Pulsometer Engineering Company speak with satisfaction in regard to the past year, for it was one of special activity, more especially in pumping machinery and large filtration plants for water-works. So far they have no indication of the slackening of business which is apparent in some branches of the trade.

Tangyes Limited report that trade in gas and oil engines was well maintained last year, and they did well with their new crude-oil engine of the semi-Diesel type, which is fitted with an arrangement enabling it to start from cold without the use of external lamps. They have practically completed a pioneer gas-engine, of 154 maximum test brake-horse-power for the Galician oilfields, which is arranged for running on natural gas, and is provided with a special design of winding gear for boring and for afterwards baling the oil. They installed pumping plant with gas-engines and suction-gas producers at Halling, for the Mid-Kent Water-Works, at Filsham, for the Hastings Water-Works extension, at Sevenoaks, and at Strood; triple Corliss pumping plant for the Northampton Corporation, and at Hong Kong; and pumps driven by electric motors at the Accra (Gold Coast) Water-Works.

Messrs. C. & W. Walker state that the contracts for the past year were very extensive. They included large Milbourne patent purifier installations for Ilford, Ramsgate, Derby, Newcastle (N.S.W.), West Melbourne, Ottawa, and Melbourne, and other purifier contracts were also entered into for Liverpool, Manly (N.S.W.), Montreal, and other places. Gasholders were put in hand for Bournemouth, Newcastle (N.S.W.), Nikkan, Sydney, and elsewhere. The gasholder for Sydney will be the largest in the overseas Dominions, and will have a total capacity of 12 million cubic feet. It will be placed in a tank, 300 feet in diameter and 48 feet deep, cut out of the solid rock, and will consist of four lifts ranging from 288 feet to 297 feet in diameter and 46 feet deep. A feature of the year's work was the large number of contracts for abroad; including sulphate of ammonia plants for Belgium and Sydney. A considerable volume of gas and chemical engineering work was also done in addition to the above. A speciality introduced last year was the Milbourne patent roller-carriage for spiral-guided gasholders which provides for the automatic continuous lubrication of the roller bearings and for the expansion and contraction of the holder

GAS HOT-WATER INSTALLATIONS.

Lecture at Glasgow.

Under the auspices of the Glasgow Corporation Gas Department, Mr. Frederick Dye, M.R.G. (of Messrs. John Wright and Co., Limited), delivered an address last Tuesday, on "Domestic Hot-Water Supply and the Application of Gas Hot-Water Circulators and Boilers." Councillor Drummond, the Sub-Convener of the Gas Committee, presided over a gathering comprising employees of the Gas Department and members of the gas-fitting trade.

Dealing with the "boot" boiler system of hot-water supply from the historical point of view, the lecturer said this apparatus, which was simply a large welded iron closed tank placed at the back of the old style of roasting fire, had to be heater and cylinder combined. When the modern closed fire range was introduced, however, it would not permit of a combined boiler and storage tank. To overcome the difficulty, it was necessary to have a heater at the fire and a cylinder situated outside connected-up with pipes to give an automatic transfer from the heater to the cylinder. In connection with the cylinder system, he pointed out that having the two pipes connected to the tank one above the other was not to get circulation, because, if they were on the same level, circulation would be got equally as well. The reason for the one being above the other was simply to distinguish between the flow and the return pipes. Supposing they were put in at the same level, it might be found on occasions that one pipe was the flow and at other times the reverse. To get the best results, it was necessary to have the flow-pipe within 3 inches of the top of the cylinder, so that hot water could be obtained quickly; and this was a most important point in connection with the economical working of gas-circulators.

Every drop of water that entered a house carried air with it, so that it was necessary to give a rise to the two pipes running between the boiler and the cylinder to get rid of the air. There was also a pipe from the top of the cylinder or storage tank which was fitted with taps. This pipe was called the expansion or steam-pipe (some referred to it as a "rising main"). The chief function of this was to clear out the air when no water was being drawn; and from this pipe the domestic supplies were taken. Another pipe of interest was the cold supply pipe. Whenever the hot tap was opened, there was an immediate inflow of cold water into the cylinder through this pipe. The cold water supply came down from the house cistern to the cylinder, and entered at the bottom, or it might enter at the side horizontally. In the former case, a T-piece should be fitted on the connection inside the cylinder, to deliver the water horizontally. So far no satisfactory means had been devised to separate the hot water from the cold.

Dealing with the cylinder system, with secondary circulation, the lecturer said that this arrangement overcame complaints of cold water being drawn before the hot water, in houses where the taps were scattered and at a long distance from the cylinder. In the secondary circulation system, instead of a single expansion pipe with its branches, the pipe was returned to form a circuit; the secondary flow going up from the top of the cylinder or expansion pipe to the highest point, and the secondary return leading from the highest point to the side of the cylinder a few inches from the top. The fault of the secondary circulation system was the slight loss entailed by radiation from the hot pipes. To prevent loss of heat, a good method was to have the pipes covered.

When inspecting a residence in connection with an installation, it was desirable to make a rough sketch of the points to which the existing system extended, marking in the size of the cylinder, pipes, and shape of boiler, &c. Some people used the gas-boiler instead of the range, whereas others had a preference for the range. It was therefore necessary that the connections should be such as to give the use of one or the other, and avoid intercirculation—a not unheard of occurrence.

At the close of the lecture, questions were put by several of the audience, and satisfactory explanations were given.

Councillor Drummond proposed a vote of thanks to the lecturer; and Mr. Alex. Wilson, the Gas Engineer and General Manager, and Mr. Ralph Halkett, the Commercial Superintendent of the department, also spoke.

Decrease in Dublin Electric Lighting Profits.—A report of the Dublin Corporation Electricity Supply Committee shows net profits on the undertaking for the past year amounting to £7767, against £11,670 in the preceding year; the reduction being attributed to dearer coal and the effect of the Shop Hours Act. The Committee are opposed to taking off the 10 per cent. added to the charges for current three years ago. It is pointed out that the Alliance and Dublin Consumers' Gas Company have also raised their charges for gas owing to the increased cost of coal. As to the refusal of the Corporation to allow profits to go to the building-up of a reserve fund and the allocation of £5500 in relief of rates, the Committee state that they are advised by Counsel that the Corporation are bound to provide the necessary funds for working expenses before allocating profits in this manner.

GAS AND RESIDUALS IN THE UNITED STATES.

Statistics for the Year 1912.

There has lately been published an extract from the report for 1912 of the Bureau of Mineral Resources of the United States. It is by Mr. E. W. Parker, of the Geological Survey, and gives the latest totals available in regard to the supply of gas, coke, tar, and ammonia. The following are some of the particulars furnished.

General Remarks.

In the total production of gas in 1912 the output of water gas exceeded the combined production of coal gas and surplus gas from retort-ovens by more than 40 per cent. in quantity and by more than 240 per cent. in value. The amount of surplus gas produced from retort-ovens—that is, gas produced in excess of that required to heat the ovens, and therefore available for use or sale—was, in turn, over 50 per cent. more than that obtained from gas-works; but the value of the gas produced at these works (most of it used as illuminating gas) exceeded that from retort-ovens, which is used chiefly as fuel, by 589 per cent.

A comparison of the statistics for 1912 with those for 1908 shows that the number of coal-gas works (including retort-oven plants), which had decreased from 516 in 1907 to 506 in 1908, further decreased to 458 in 1912. Part of this decrease was due to consolidations of former competing companies into one organization; part was due to changes from coal gas to water gas; and part, particularly in small towns, to the replacement of gas by electricity for illumination. The number of retort-oven plants increased from 25 in 1908 to 34 in 1912, and the number of coal-gas works decreased from 481 to 424.

The quantity of coal carbonized in gas-works rose from 3,553,920 short tons in 1908 to 3,957,060 tons in 1912; but the quantity of coal gas produced and sold decreased from 37,355,886,000 to 35,202,124,000 cubic feet. The coal carbonized in retort-ovens, on the other hand, increased from 5,699,058 short tons to 14,767,543 tons, and the quantity of surplus gas produced and sold (or used for other purposes than heating the ovens) increased from 16,205,925,000 to 54,491,248,000 cubic feet. It should further be observed that the quantity of coal gas (including that made both at gas-works and at retort-ovens) sold for illumination was 31,864,052,000 cubic feet in 1912, against 32,485,571,000 cubic feet in 1908—a decrease of more than 620,000,000 cubic feet; whereas the quantity used as fuel increased from 21,076,242,000 to 57,829,320,000 cubic feet.

The influence exerted by the largely increased production of retort-oven gas is exhibited in the apparent marked decline in values. The total value of gas sold for illumination in 1912 was less than that of 1908 by $6,000,000, or more than 25 per cent.; whereas the decrease in quantity was less than 2 per cent. The value of the fuel gas increased less than 50 per cent.; whereas the quantity produced increased nearly 175 per cent. The average value of illuminating gas was 55 c. per 1000 cubic feet in 1912, against 73 c. in 1908; and the average value of fuel gas was 33 c., against 65 c. in 1908. Even in states where retort-oven gas did not affect production and values, the general tendency was towards lower prices in 1912, though there were a few exceptions to this rule.

As compared with the decrease from 481 in 1908 to 424 in 1912 in the number of coal-gas works (exclusive of retort-oven plants), it is interesting to note that reports were received from 604 water-gas companies in 1912, against 552 in 1908, and that the total production of water gas increased nearly 19 per cent. The decreased consumption of artificial gas for illumination and its increased use as fuel (for which its convenience and its freedom from smoke and ashes render it growingly popular) are as strikingly presented in the statistics of the production of water gas as in those of the manufacture of coal gas.

The water gas sold for illumination from 1908 to 1912 decreased 11 per cent. in quantity and 10 per cent. in value; whereas that sold for fuel increased more than 100 per cent. in quantity and 86 per cent. in value. Practically all the water gas sold for fuel is used for domestic purposes or in relatively small gas-engines. The same may be said of coal gas made at gas-works; but the larger part of fuel gas produced at retort-ovens is used in iron and steel works or other large industrial establishments. In this lies the explanation of the higher average values of water gas (92·4 c. per 1000 cubic feet for illumination and 89 c. for fuel in 1912) compared with those of coal gas.

The production of coke, tar, and ammonia increased with the increase in the production of gas at gas-works and retort-ovens, and the increase was accompanied by advances in price. The average value per ton for coke advanced from $3·44 to $3·87, owing to the larger proportion of retort coke in the total. Tar was valued at 2·5 c. per pound in 1908 and 2·8 c. in 1912; ammoniacal liquor (reduced to equivalent in NH_3) was 6·4 c. per pound in 1908 and 9·2 c. in 1912; and ammonium sulphate was nearly 1 c. a pound higher in 1912 than in 1908.

Production.

The total quantity of artificial gas produced in the United States in 1912, reported by 1062 establishments, was 228,076,510,000 cubic feet. Of this production, about 7 per cent. (15,685,342,000 cubic feet) was lost or unaccounted for; so that the quantity sold or utilized amounted to 212,391,168,000 cubic feet. This was valued at $148,282,725, or about 70 c. per 1000 cubic feet. In 1908, the latest previous year for which the statistics were collected, the net production (that is, the total production less the gas unaccounted for) was 156,909,310,000 cubic feet, valued at $133,571,122, or about 85 c. per 1000 cubic feet. There was a general decrease in prices in 1912 compared with 1908, except in the value of oil and water gas; but the chief cause of the apparent decline of nearly 20 per cent. in the mean average price was the largely increased production at retort-coke ovens of gas that was extensively used at manufacturing plants connected with the coke-works and charged to the consuming establishments at merely nominal prices—much of it at less than 10 c. per 1000 cubic feet. The average price of oil and water gas sold for illumination in 1912 was a fraction of a cent higher than in 1908; the figures being respectively 92·4 c. and 92 c. per 1000 cubic feet. The average price for this gas sold for fuel shows a decline from 98 c. in 1908 to 89 c. in 1912. The average price for coal gas, which includes the surplus gas from retort-ovens, was 70 c. in 1908 and 41 c. in 1912. The decline in the average price of this gas used as fuel was nearly 50 per cent.—from 65 c. in 1908 to 33 c. in 1912. The average price of illuminating gas declined from 73 c. to 55 c.

The quantity of illuminating gas used in 1912 was less than in 1908; coal gas falling off about 620 million cubic feet, and oil and water gas more than 8600 millions. This decrease in the consumption of illuminating gas is due in part to the more extended use of gas-saving devices, such as the Welsbach burner, and in part to the increased use of electric light—the latter probably predominating. On the other hand, the use of gas as fuel shows a marked increase—from 47,619,193,000 cubic feet in 1908 to 112,390,847,000 cubic feet in 1912. This increase, for reasons already stated, was chiefly in coal gas—from a little over 21,000 million cubic feet in 1908 to nearly 58,000 millions in 1912—though the use of oil and water gas as fuel also shows an increase of more than 100 per cent.—from 26,500 millions in 1908 to 54,500 millions in 1912.

The associated products in the manufacture of gas from coal in 1912 consisted of 12,490,757 short tons of coke, valued at $48,380,009; 134,796,438 gallons of tar, valued at $3,802,047; 51,527,074 lbs. of anhydrous ammonia (the ammoniacal liquor being reduced, when strength of liquor was reported, to its equivalent in NH_3), valued at $4,776,386; 35,242,549 gallons of ammoniacal liquor (strength not reported), valued at $1,002,807; and 99,070,777 lbs. of ammonium sulphate, valued at $3,740,075. In 1908 the associated products consisted of 6,253,125 tons of coke, valued at $21,507,045; 110,430,663 gallons of tar (including 9,168,834 gallons of water-gas tar), valued at $2,766,700; 30,615,835 lbs. of anhydrous ammonia, or its equivalent, valued at $2,065,169; and 44,093,437 lbs. of ammonium sulphate, valued at $1,322,807.

In the following table the coal carbonized in gas-works is separated from that made in bye-product ovens; the statistics covering also the gas, coke, and tar produced in 1903, 1904, 1905, 1907, 1908, and 1912. As previously stated, in giving the production of gas in bye-product ovens, only the "surplus" gas is considered—that is, the gas over and above that used for heating the ovens. The quantity of gas sold at gas-works per ton of coal carbonized was 8896 cubic feet, compared with 3680 cubic feet of surplus gas from retort-ovens.

	Gas-Works.	Retort-Ovens.	Total.
Coal coked, short tons	3,957,060	14,767,543	18,724,603
Coal gas produced and sold, 1000 cubic feet	35,202,124	54,491,248	89,693,372
Coke produced and sold, short tons	1,375,593	11,115,164	12,490,757
Tar produced and sold, gallons	40,489,855	94,306,583	134,796,438

Production of Coal Gas.

Reports to the Geological Survey of the production of coal gas in 1912 were received from 458 coal-gas and bye-product coke works, and indicate a decrease of 48 in the number of gas-making establishments compared with 1908, when reports were received from 506 concerns. The reason for the decrease in the number of coal-gas works has already been discussed. Of the 458 establishments reporting in 1912, 34 were bye-product coke-works and 424 were gas-works. In 1908 there were 481 gas-works and 25 bye-product coke-works. The 34 bye-product coke-works in 1912 produced surplus gas to the amount of 54,491,248,000 cubic feet out of a total of 89,693,372,000 cubic feet of gas produced and sold. The 424 gas-works produced 35,202,124,000 cubic feet in 1912.

In 1908 the 25 bye-products coke-works produced 16,205,925,000 cubic feet, and the 481 coke-works 37,355,886,000 cubic feet of gas. In these figures the quantity of gas lost through leakage, fire, or otherwise, reported in the tables as unaccounted for, is not included. This item in 1908 amounted to 3,382,856,000 cubic feet, and in 1912 it was 3,675 629,000 cubic feet. The total quantity of gas sold in 1912 was 89,693,372,000 cubic feet, valued at $36,681,884, or an average of 41 c. per 1000 cubic feet. In 1908 the total gas sold was 53,561,813,000 cubic feet, valued at $37,227,901—an average of 70 c. per 1000 cubic feet. The value of the gas produced at coke-works in 1912 was $4,650,517, or about 8½ c. per 1000 cubic feet, and the value of that produced at gas-works was $32,031,367, or 91 c. per 1000 feet.

In 1908 the coke-oven gas was valued at $2,557,483, or about 15 c. per 1000 cubic feet, and the gas from gas-works at $34,670,418, or 93 c. per 1000 cubic feet; indicating a decrease in value of 2 c. in 1912 in the commercial product at gas-works, which is used largely for domestic purposes, lighting, and heating, whereas the average value of the coke-works gas was about 15 c. in 1908 and 9 c. in 1912. The reason for this apparent decline is found in the relatively larger proportion of the coke-oven gas used at industrial plants associated with the coke-ovens, and the smaller proportion sold for distribution through city mains.

The quantity and value of gas produced and sold at the bye-product coke-works and coal-gas works of the United States in 1912 are shown in the following table:

	Coal Gas.	Oil and Water Gas.
Number of establishments	458	604
Coal carbonized, short tons	18,724,603	—
Gas made, 1000 cubic feet	93,369,001	134,707,509
Gas sold for lighting purposes—		
Quantity, 1000 cubic feet	31,864,052	68,136,269
Value	$17,599,656	$62,931,596
Price per 1000 cubic feet	$0·55	$0·924
Gas sold for fuel purposes—		
Quantity, 1000 cubic feet	57,829,320	54,561,527
Value	$19,082,228	$48,669,245
Price per 1000 cubic feet	$0·33	$0·89
Total gas sold—		
Quantity, 1000 cubic feet	89,693,372	122,697,796
Value	$36,681,884	$111,600,841
Price per 1000 cubic feet	$0·41	$0·91
Unaccounted for, 1000 cubic feet	3,675,629	12,009,713

In the preceding table the gas sold for illumination is separated approximately from that sold for fuel. It is impossible to separate

exactly the fuel gas and the illuminating gas; for although in many places, in order to encourage the use of gas for cooking, additional meters are installed and a lower price is charged for such gas, there are just as many places where the gas for both lighting and cooking passes through the same meter, so that only approximate estimates of the quantities used for the two purposes are obtainable. Where gas is used in large quantities for the generation of power separate meters are generally installed, and the quantity so used can therefore be more accurately determined than that employed otherwise than for illumination by domestic consumers.

The manufacture and transportation of gas necessarily involves a considerable loss through leakage, fire, and other accidents; and in the total production of 93,369,007,000 cubic feet in 1912, 3,675,629,000 cubic feet, or 3·9 per cent., were reported as lost or unaccounted for. This loss in 1912 was considerably less than that reported in 1908, when, out of a total of 56,944,669,000 cubic feet, the loss was 3,382,856,000 cubic feet, or 5·9 per cent. The largest percentages of loss in 1912 were reported in the production of Texas, and in the combined production of California and Oregon—in each case more than 17 per cent. The smallest percentages of loss were reported in Maryland (0·2), in the combined production of Alabama and Arkansas (0·6), and in Indiana (0·7). In 1908 the largest losses were shown in the output of Virginia and West Virginia, and the smallest were reported in the output of New Jersey, Pennsylvania, and New York.

The statistics of production of gas reported to the Geological Survey in the years for which this information has been obtained show a considerably more rapid increase in the quantity used for fuel than for illumination. The greater part of this more rapid gain in fuel-gas consumption has been due to the increasing output from bye-product retort coke-ovens and to less extent to the increasing popularity of gas for cooking and heating. The quantity of coal gas used for illumination from 1908 to 1912 shows an actual decrease of about 620 million cubic feet; and an even larger decrease is shown in the consumption of oil and water gas for illumination. Economies in the use of gas for illumination have been effected by installing gas-saving devices, such as the Welsbach burner; and these devices possibly decrease somewhat the consumption of illuminating gas. The greater part of the decrease, however, is probably due to the substitution of electric light for gas light. On the other hand, the quantity of coal gas sold for fuel increased approximately 36,750 million cubic feet—from 21,076 millions in 1908 to 57,829 millions in 1912. The percentage of illuminating gas used decreased from 60·7 in 1908 to 35·5 in 1912; and the percentage of gas used for fuel increased from 39·3 to 64·5. This increase in the quantity and percentage of gas used for fuel is naturally due to the greater output from coke-ovens—from 16,206 million cubic feet in 1908 to 54,490 millions in 1912.

Production of Oil and Water Gas.

Since the manufacture of coke in retort-ovens assumed, in 1897, proportions large enough to give it rank as an independent industry, the problems connected with the bye-products obtained have created a desire for statistics of these products, and, in addition, those which are the output of gas-works. In order to meet this demand, the Geological Survey prepared a special report on the production of gas, coke, tar, and ammonia in 1898. Similar reports were prepared for the calendar years 1903, 1904, 1905, 1907, and 1908. The publication of these reports has, in turn, created a desire for information concerning the production of oil and water gas; and, in response to numerous requests, the reports on the production of gas, tar, and ammonia in 1905, 1907, and 1908 were supplemented by a section on the production of oil and water gas. A similar section for 1912 has been added to the present report.

It is of particular interest to note that, though the production of coal gas showed a decrease from 1907 to 1908, and again from 1908 to 1912, the production of oil and water gas showed an increase in both periods. In fact, the production of oil and water gas has developed with somewhat marked rapidity in recent years, and a number of companies that formerly produced coal gas now make wholly or in part water gas, which is enriched by the use of oil. Other plants, especially those in cities adjoining large oil-producing fields, are manufacturing illuminating gas from crude petroleum. The statistics of the production of oil gas and water gas are here combined.

In 1907 there were 516 coal-gas companies reporting to the Geological Survey; and in 1912 there were 458—a decrease in five years of 58 In 1907 there were 13 less than in 1905, two years before. The number of companies reporting a production of oil and water gas to the Geological Survey has, on the other hand, increased from 477 in 1905 to 520 in 1907, to 552 in 1908, and to 604 in 1912; and the quantity of oil and water gas produced and sold rose from 103,347,497,000 cubic feet to 122,697,796,000 cubic feet. This indicates a normal increase; but it should be observed that the consumption of oil and water gas, as of coal gas, for illumination has decreased, and that the decrease in the consumption of oil and water gas for illumination is more than ten times the decrease in the consumption of coal gas for illumination. The quantity of oil and water gas sold for illumination in 1908 was 76,804,546,000 cubic feet, valued at $70,294,158, or 92 c. per 1000 cubic feet; in 1912, the quantity was 68,136,269,000 cubic feet, valued at $62,931,596, or 92·4 c. per 1000. The oil and water gas sold for fuel increased from 26,542,951,000 cubic feet, valued at $26,049,063, or 98 c. per 1000, in 1908, to 54,561,527,000 cubic feet, valued at $48,669,245, or 89 c. per 1000, in 1912.

The larger part of the oil and water gas used as fuel is consumed in households for cooking and heating. In many places this gas is passed through the same mains and the same meter as the illuminating gas, and is sold at the same price. In other places separate meters are used, and reductions are made in the price of the gas employed for cooking and heating. The total difference is not much, however, as the average price for illuminating gas was 92·4 c. per 1000 cubic feet in 1912, and the average price for fuel gas was 89 c. In 1908 about 75 per cent. of the total quantity of oil and water gas produced was sold for illumination, and 25 per cent. for fuel; whereas in 1912 only 56 per cent. of the oil and water gas was used for illumination, and 44 per cent. for fuel. Of the total oil and water gas produced in 1912, 12,009,713,000 cubic feet, or 9 per cent., was lost or unaccounted for. The gas lost or unaccounted for at the coal-gas and retort-oven works was 3·9 per cent.; the larger loss of water gas being due to the much greater proportion of that gas distributed through city mains, and not directly to manufacturing establishments.

Production of Coke.

The production of coke in bye-product ovens and at gas-works increased from 6,253,125 short tons, valued at $21,507,045, in 1908 to 12,490,757 tons, valued at $48,380,009, in 1912. The increase in quantity was almost exactly 100 per cent., and the gain in value was nearly 130 per cent. The average value per ton in 1912 was $3·87; while in 1908 it was $3·44. The average yield of coal in coke was 72·7 per cent. in 1912, against 63·9 per cent. in 1908. The increase in production, the relatively larger gain in values, and the higher percentage yield of coal in coke were all due to the progress made during the last few years in the manufacture of coke in bye product ovens. The quantity of coke produced in gas-works decreased from 2 051,899 short tons in 1908 to 1,375,593 tons in 1912; whereas the quantity produced in bye-product ovens increased from 4,201,226 to 11,115,164 tons. The oven coke, being a fuel suitable for blast-furnace, foundry, or smelter use, commands a much higher price in the same markets than gas-works coke, which is suitable only for domestic purposes, for steam-boilers, or for relatively low-temperature heating. The average value per ton for gas and oven coke in 1912 was $3·87.

The total quantity of coal carbonized or coked at gas-works and in bye-product ovens in 1912 was 18,724,603 short tons, of which 14,767,543 tons were coked in ovens and 3,957,060 tons used at gas-works. These figures compare with a total of 9,252,978 tons of coal carbonized in 1908, of which 5,699,058 tons were coked in ovens and 3,553,920 tons at gas-works. The number of gas-works reporting production and sales of coke in 1912 was 397, against 442 in 1908—a decrease of 45; the number of bye-product plants increased from 25 to 34. This indicates a combined net decrease of 36 plants—from 467 in 1908 to 431 in 1912.

Production of Coal Tar.

Of the 458 companies reporting production of coal gas in 1912, 428 reported sales of coal tar. In 1908 the production of coal tar was reported to the Geological Survey by 471 companies out of a total of 506. The production (meaning sales) increased from 101,261,829 gallons in 1908 to 134,796,438 gallons in 1912. The value increased from $2,537,118 to $3,802,047. The increase in quantity was 33,534,609 gallons, or 33 per cent., and the gain in value was $1,264,929, or almost exactly 50 per cent. The average value per gallon was 2·8 c. in 1912, against 2·5 c. in 1908. These figures indicate that the demand has not only kept pace with the increased production, but has somewhat exceeded it. From 1893 to 1908 the prices for coal tar steadily declined.

The growing demand since 1908 has been due chiefly to the extended use of prepared tar for roads and to the employment of creosoting oils for preserving railroad ties. The increase in the first-named use is caused by the greater road wear due to automobile traffic; and the transportation companies have been driven to the second use by the rapidly advancing prices of timber. Apart from tar used on roads and of creosoting oils, the chief manufactures from crude tar in the United States are refined tar for saturating roofing felt and various grades of pitch made for roofing, waterproofing, paving, briquetting, and like purposes. The lighter tar oils, such as benzol and toluol, are recovered from the gas rather than from the tar, though a small amount is distilled from tar. The increase in demand for the lighter petroleum oils for use in motors has tended to encourage the recovery of the light tar oils from coke-oven gas.

The manufacture of aniline oil and salts from coal-tar oils has not reached the economic importance in the United States that it has attained in some European countries, notably Germany, where large and manifold chemical industries are based on the utilization of coal-tar derivatives. This backwardness is due partly to competition with foreign products, made possible chiefly by the higher cost of the labour in America. The value of the imports into the United States of chemical products from coal tar amounts annually to more than $10,000,000. The duty averages about 10 per cent. *ad valorem*. As a matter of fact, however, the value of the primary coal-tar derivatives forms only a small percentage of the value of the imported coal-tar products; the value of the acids and other reagents employed in their manufacture contributing the larger part of the ultimate value.

The yield of tar per ton of coal consumed in 1912 ranged from 4·08 gallons in Indiana to 18·56 in the combined production of Delaware and the District of Columbia. The general average yield was 7·53 gallons. The average value per gallon ranged from 2·1 c. in Maryland to 6·5 c. in the combined production of Kansas, Nebraska, and Oklahoma.

Production of Oil and Water Gas Tar.

A notable development in the production of artificial gas in 1912 was in the recovery and sale of tar in the manufacture of oil and water gas. In 1908, when the production of water gas was a little over 103,000 million cubic feet, the recovery of tar amounted to 9,168,834 gallons, in addition to which about 5,500,000 gallons were reported as produced but not sold. The total production was, therefore, a little less than 0·15 gallon, and the quantity sold 0·09 gallon, per 1000 cubic feet. In 1912, when the production of water gas was 122,700 million cubic feet, the quantity of tar recovered and sold was 33,930,273 gallons, or nearly 0·28 gallon per 1000 cubic feet of gas. About 32,000,000 gallons were reported as produced and not sold; making the total production 0·54 gallon per 1000 cubic feet.

As a further indication of the fact that water-gas tar has been found a useful element in the economy of gas production, the average value per gallon has advanced from 2·5 c. in 1908 to 2·8 c. in 1912; the average value per gallon in the latter year being the same as that of tar produced at coal-gas works and in retort-ovens. The total value of the water-gas tar produced and sold in 1908 was $229,582; in 1912 the value of the oil and water gas tar produced and sold was $963,546.

Production of Ammonia.

About one-third of the establishments producing gas and coke from

coal report the recovery of ammonia; the returns being for ammoniacal liquor, anhydrous ammonia, or ammonium sulphate. In making the reports on the quantity of ammoniacal liquor produced, somewhat different methods are employed. Some companies reported the production in liquor-ounces selling at a certain price per 100 liquor-ounces of a specific strength; others reported the production in gallons, sales being made at a certain price per pound or by the ammonia contained; others reported the production in gallons of ammoniacal liquor at so much per gallon, according to the strength of the liquor. Then, again, the strength of the liquor is reported by some producers in ounces, by others in degrees Twaddel, and by others in the percentage of anhydrous ammonia (NH_3).

In preparing the statistics of ammonia production for previous reports, the compilations were made according to the strength of the liquor. For the present report, where the strength of liquor has been reported, the production of liquor has been reduced to the equivalents in anhydrous ammonia, and is distributed, when possible, without divulging individual figures, according to states. The total quantity of anhydrous ammonia thus derived in 1912 was 51,527,074 lbs., valued at $4,776,386 In addition to this there were 35,242,549 gallons of liquor, valued at $1,002,807, the strength of which was not reported. In 1908 the quantity of anhydrous ammonia, or its equivalent, produced and sold amounted to 30,615,835 lbs., valued at $2,065,169. The production of ammonium sulphate amounted to 99,070,777 lbs. in 1912, valued at $3,740,075, against 44,093,437 lbs., valued at $1,322,807, in 1908.

In the following table the total ammonia in 1912 is given, together with the quantity of coal carbonized and the value of the ammonia and ammonium sulphate produced:

Coal carbonized, short tons	18,200,626
Anhydrous ammonia, or its equivalent, produced and sold, pounds	51,527,074
Ammoniacal liquor (strength not reported), gallons	35,242,549
Ammonia produced and sold as sulphate, pounds	99,070,777
Value received—	
For anhydrous ammonia or its equivalent	$4,776,386
For ammoniacal liquor	1,002,807
For ammonium sulphate	3,740,075
Total	$9,519,268

AGGREGATE PRODUCTION AND VALUE.

The following table gives the quantity and value of the gas, tar, coke, and ammonia produced in the United States in 1912. The aggregate value was $98,383,208, as against $64,660,040 in 1908.

Quantity.

Coal gas made, 1000 cubic feet	89,693,372
Bye-products—	
Tar made and sold, gallons	134,796,438
Anhydrous ammonia produced, pounds	51,527,074
Coke made and sold, short tons	12,490,757
Gas unaccounted for, 1000 cubic feet	3,675,629

Value.

Coal gas made		$36,681,884
Bye-products—		
Tar	$3,802,047	
Total ammonia	9,519,268	
Coke	48,380,009	
		61,701,324
Total gas and products		$98,383,208

Haywards Heath Gas Bill.

The shareholders of the Haywards Heath District Gas Company met at the offices at Haywards Heath, last Friday afternoon, for the purpose of considering a proposed Bill to extend and define the limits of supply, to provide for the conversion of the existing capital, and to confer further powers upon the Company. Mr. Cæsar presided, in the absence (through illness) of Mr. Charleton. The Chairman explained the provisions of the Bill, and made it clear that the Directors had taken every precaution in protecting the interests of the shareholders. It was, he said, proposed to convert the existing capital into stock; and the holders of the £10 original shares would receive for each share £20 worth of ordinary stock, while the holders of the additional £10 shares would be given upon each share £14 worth of ordinary stock—thus securing for them the same return per cent. as they were at present receiving. It was proposed to secure £45,000 extra capital; the progress of the Company and the growth of the districts already served warranting this. The speaker wished it to be understood that the Directors fully intended to supply gas to the new areas they had scheduled, provided there was a demand for it. It was proposed to oppose the granting of a Provisional Order to the Balcombe Petrol Air Gas Company. The authorities which were opposing the Haywards Heath Company, if they put forward reasonable and fair proposals, would meet with every consideration from the Company. The Bill was approved.

A Real "Progressive" Candidate at Manchester.—Mr. Frank Lowe, a working man candidate for the Manchester City Council, has just issued his address to the electors of the New Cross district—a neighbourhood which is densely populated with working-class people. "In the badly erected and ill-equipped houses which they perforce occupy," says Mr. Lowe, "the housewife would have much less work if gas were obtainable at such a price as would make its use for cooking and heating practicable." He was afraid the working men thought too little of the unnecessary work entailed upon their wives by the use of coal, and of the economy of their time and labour, the greater cleanliness of their homes, and the better health of children which would accrue from the general use of gas in the small home.

BOLTON AND DARWEN WATER ARBITRATION.

The Cost of Obtaining and Impounding Water.

Several days were occupied recently in the hearing of an arbitration between the Bolton Corporation and the Darwen Corporation. The proceedings took place at the Surveyors' Institution, Westminster, S.W.; and the point to be decided was the price which the Darwen Corporation are to pay to the Bolton Corporation for the supply of 300,000 gallons of water a day, delivered at a point on the boundary of Darwen. In 1905 the Bolton Corporation obtained an Act authorizing them, among other things, to construct additional water-works; and in this, at the request of the Darwen Corporation, the Committee inserted the following section (28): "At the expiration of the period of eight years from the passing of this Act, the Corporation shall supply and continue to supply to the Corporation of Darwen at such point on the boundary of the borough of Darwen as that Corporation may reasonably require, and that Corporation shall continue to receive, and pay for, a quantity of water per day of 300,000 gallons; and the price to be paid for such water by the Corporation of Darwen and the point of supply shall, if not agreed upon, be determined by a water engineer to be appointed in case of difference by the Local Government Board. In determining the matters referred to in this section, the said water engineer shall have regard to all the circumstances of the case."

Mr. H. HOWARD HUMPHREYS acted as Arbitrator. Mr. BALFOUR BROWNE, K.C., and Mr. W. J. JEEVES (instructed by Messrs. Dyson and Co., Agents for the Town Clerk of Bolton) appeared for the Bolton Corporation; while Mr. E. SUTTON and Mr. RAITH SUTTON (instructed by the Town Clerk of Darwen) represented the Darwen Corporation.

Mr. BALFOUR BROWNE, in opening the case, said that Bolton did not want Darwen as partners—in fact, they objected to them being heard at all before the Committee But on the ground that Bolton were at that time proposing to make a reservoir which would have lent itself to a scheme for Darwen (though they did not have a scheme), Darwen were able to get the Committee to take a sympathetic view; and the result was the insertion in the Act of section 28. There had been certain negotiations; and the point of delivery of the water had been agreed. Thus the only thing to be now determined was the price to be paid. Darwen had become partners with Bolton, in a sense, for the whole scheme that was authorized in 1905. In ascertaining how the supply was to be given, the Bolton Corporation had come to the conclusion that the best and cheapest method was to take the supply at a place called Egerton Tank, just below the Delph reservoir, and to pump the water from there to the point where it had to be delivered to Darwen. This would involve a rising main; and the Corporation had put in a 12-inch one, 3200 yards long. The pumping would be by electrical power, obtained from the Lancashire Power Company. At the pumping-station the water would have cost Bolton so much per 1000 gallons; the sum being arrived at by ascertaining how much water there was available, and the capital cost. In time, Bolton would have to build another reservoir; and a portion of the cost of this would have to be borne by Darwen—they being, as he had said, to this extent partners in all the works authorized by the Act of 1905. Of course, no works previous to the Act would be included in the calculations, as Darwen were not then partners. When various works he enumerated came into being, the price of water would go up; and for a considerable time it would remain up, after which it would gradually go down again. What the Corporation had done was to equate all these prices, and give a figure of 8·494d. per 1000 gallons as the cost of the raw water. Then there was the cost of delivering the water, which came to another 2·244d. per 1000 gallons; and lastly the cost of filtration and treatment, which worked out at 0·838d. This made the total cost 11·576d. per 1000 gallons. There were also to be reckoned risks of accident, insurance, &c., which he put at 12½ per cent. upon the figure already given. This would be 1·447d., and would make a total of 13·023d. per 1000 gallons. Nothing was added for profit.

Mr. *Lewis Mitchell*, Water Engineer to the Bolton Corporation, was the first witness called; and he was examined by Mr. JEEVES. He stated that he succeeded Mr. Swindlehurst, who was Engineer in 1905, and who was now dead. In pursuance of the obligation imposed by section 28, witness was instructed by the Bolton Corporation to carry out the necessary works to enable them to fulfil it. The works consisted first of a pumping-station at Egerton, comprising two centrifugal pumps driven by electric motors. From this there was the 12-inch cast-iron rising main to a service reservoir, having a capacity of 200,000 gallons. Leading from the service reservoir to the filter-beds was a 9-inch cast-iron gravitation main; and from the filter-beds there was a 9-inch cast-iron delivery main to the agreed point on the boundary of the borough of Darwen. The mains were capable of providing 300,000 gallons of water a day. The works were completed on Aug. 11 last; and on that date (the one fixed by the section), the supply of the water to the point of delivery began. Darwen were, however, not ready to take it, and undertook to pay any damage occasioned by their unreadiness. Witness put in a table showing the necessity for proceeding with further works under the Act of 1905. Other tables set forth the means by which the figures quoted by Mr. Balfour Browne had been arrived at. Darwen would, he said, benefit from the excellent arrangement Bolton had entered into with the Lancashire Electric Supply Company for power at the pumping-station. The price was to be 0·33d. per unit, with a small addition for every 1d. per ton advance in the price of coal upon 11s. per ton, and a corresponding allowance for any reduction.

Mr. SUTTON said his contention was that Darwen were entitled to be supplied from the Cadshaw Brook, and to pay the costs that would be incurred if they were so supplied. In Parliament, they asked to be supplied from the Cadshaw reservoir. But this might not be built; and he did not see that they ought to be limited to it.

Mr. *Percy Farnworth*, in answer to Mr. JEEVES, said he was Borough Treasurer of Bolton. He put in a table showing the estimated cost of raw water to be obtained from the works proposed to be constructed under the powers of the 1905 Act. The yield of the works, on full utilization, he placed at 1,697,876,600 gallons a year, and the cost at 7·923d. per 1000 gallons. On the estimated average utilization up to

1939, he reckoned the annual yield of water at 1,515,805,385 gallons, and the price at 8·494d. per 1000 gallons. This was the figure which would merely indemnify Bolton. It included a share of the interest and sinking fund. The costs of delivering, filtering, management, &c., already referred to, would bring the total to 13·023d., or (say) 1s. 1d. per 1000 gallons. Bolton, of course, took all the risk there was; and he tried to cover this. If, for instance, the undertaking did not pay its way, it would be necessary to rate the citizens of Bolton—there was no provision for getting anything out of those of Darwen. As a matter of fact, a rate in aid of the water undertaking never had been levied in Bolton. They were, however, within 5 per cent. of the maximum charge for domestic supply. The Water Committee had had to increase their charges to consumers in the borough to 9d. per 1000 gallons for water by gravitation, and 1s. 1½d. outside the borough boundaries. There was no difference in the charge to domestic consumers inside and outside the borough. They made a profit from the outside authorities up to 1903; and then they were no longer permitted to charge them any more. Now they were prohibited from allocating profit in aid of rates. The charge for water in Bolton at the present time was rather less than in Darwen.

Mr. *James Watson*, the Water Engineer to the Bradford Corporation, examined by Mr. JEEVES, said that, in his opinion, the existing and proposed new storage reservoirs would be sufficient to deal with the rainfall yield of the district, taken on the usual basis of three dry years. He had examined the drainage area, and the site on which it was originally proposed to construct the Cadshaw reservoir. It would be a very difficult site indeed to deal with; and with the knowledge available at the present moment, he hardly thought an engineer could compute a probable estimate of the cost upon which any reliance could be placed. Under these circumstances he would not advise the placing of a reservoir there. Asked what, applying his great experience in these matters to the provisions of the Bolton Act, would in his view be a reasonable basis for arriving at the charge to Darwen, witness said the usual and reasonable basis in cases of this kind was to ascertain as best one could the prime cost of the water. This was simple enough, inasmuch as there was the quantity and there was the expenditure, including the sinking fund and the other additions. If, as had been pointed out, from the available yield (say) in a year like 1911, or in a series of dry years which came periodically, the quantity of water to be obtained was, practically, 5¼ million gallons a day, then this 5¼ million gallons ought to be the factor used in the equation relative to the expenditure that was required to produce it. At the present time it was perfectly clear to him that Bolton was drawing out of a reserve which, of course, in an ordinary dry year they could not maintain, so that the potential limit of the supply was practically at the present moment roundly 5¼ million gallons a day. No matter what dry seasons came along, Darwen would have to be supplied with the 300,000 gallons a day; and therefore provision must be made for giving this, at any rate on the average of three dry years. What they had to do was to ascertain the prime cost to be divided by this factor of the average of three dry years. That was to say, the prime cost of the water derived from the works under the 1905 Act. Darwen had nothing whatever to do with the supply which Bolton possessed before the Act of 1905. In fact, it would be very unfair to deal with the state of affairs antecedent to 1905, because works of this kind under the old conditions prior to that time cost a great deal less than they did to-day. If the Cadshaw reservoir were constructed, they would not get a drop of water extra; and it would only increase the cost that would have to be charged to Darwen.

The ARBITRATOR: Do you consider, speaking generally, that the Bolton Corporation have an expensive water scheme? Would you say generally, having regard to Bradford, Huddersfield, Halifax, and all the towns you know so well, that the Bolton system of collection is expensive?

Witness: I think the Bolton water undertaking will compare quite favourably with Huddersfield, Halifax, Bradford, and a good many other places that I could point out.

Mr. *H. Prescott Hill*, of the firm of Messrs. Hill and Sons, said he was conversant with the water-works at Bolton. The general scheme of the Act of 1905 was to construct five reservoirs—Delph, Eagley, Hordern, Broadhead, and Cadshaw. The Cadshaw reservoir would be in the watershed of the Entwistle reservoir; and the whole of the water falling upon this watershed in a period of drought was fully dealt with by the Entwistle reservoir. So that during this period there would be no surplus water to be put into the Cadshaw. Supposing Bolton had not gone to Parliament for a new scheme in 1905, they could not have supplied Darwen with a drop of water. This was indicated by the fact that they could not take their supply for eight years, so as to give Bolton time to construct an additional reservoir. He agreed with the figures given as to the cost of the raw water.

Mr. *William Terrey*, the General Manager of the Sheffield Corporation Water-Works, replying to Mr. JEEVES, said that the special factors in the present case, from a careful review of the evidence, appeared to him to be the cost of constructing the necessary works under the Act of 1905, the point of delivery, the distance from the source of supply, and the level at which the water was to be supplied to Darwen. Applying these factors, he agreed with evidence already given that the basis which should be taken was the actual cost, so far as it had been ascertained, for Delph, *plus* the estimated cost of the other works, with the addition of 25 per cent. for the increased cost of labour and materials. On the top of the actual cost of the works, and delivery and filtration, a reasonable sum should be added to cover risks of casualty. In addition to the cost of construction, conveying, and filtering, the exceptional items which he would cover were maintenance of the works, &c., the risks attending frost years and periods of drought, unavoidable causes of accidents, and possible deficiencies (which, in fact, were sure to arise) on the revenue account from time to time as new works were brought in. Then there was the increased amount of rates that would have to be paid. The providing of the interest was not the only cost one was put to in the management of a

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LEST YE FORGET.

loan. In fact, under an Act of 1896, by which Rotherham and Doncaster obtained water at cost price, they paid Sheffield ¼ per cent. on the capital simply in respect to the management of the loan. In the estimates for the present case, the 25 per cent. addition was an exceedingly moderate one to make to the parliamentary estimates to cover increased price of labour and materials. The increased cost of labour was forcing itself into every department, so that it really affected the cost of production. So far as he was purchasing now, he found that the plant and materials were being affected to the extent of from 40 to 60 per cent. in excess of the prices paid eight years ago. The actual cost of the works at Delph which were completed was very moderate. In arriving at the charge for Darwen, the scheme of 1905 as a whole should be taken, because, if the supply were furnished from Delph, it would simply mean, so far as Bolton were concerned, that it displaced a certain proportion of their supply. It cut off a part of that reservoir, and drove them to a more distant reservoir for their own supply. Therefore it was only fair that the average cost of the scheme should be taken. There was no reason why Darwen should have the benefit of the low cost of any works carried out before 1905. These works were completely used for the supply of the Bolton area. Further, the works were acquired by the Bolton Corporation in 1847, and were constructed at a time when works of this character were very much cheaper than they were now. The average cost of the existing works was only £181 per million gallons of the daily supply, as compared with an ascertained cost for Delph of £270 per million gallons. It would be manifestly unjust that those works which had been acquired by Bolton, and which were completely utilized, should be placed to the benefit of Darwen, or that they should derive any advantage from them whatever. It would be impossible to replace the works at anything like the cost now. There was at present a difference of 70 per cent. in these costs, as between old and new works. He could not see that a bargain which originated in 1905 had any relation whatever to the action of the Corporation in acquiring and controlling their own supply years before. The cost to the Bolton Corporation of those works obtained so many years ago bore absolutely no relation to the cost of construction to-day.

Cross-examined by Mr. SUTTON, witness said that, as a rule, whenever new works were constructed, there was a large deficiency which corporations had to make up in early years following the construction. This period, of course, varied according to the length of time during which they had surplus water on their hands. When the whole of the water was utilized, it was time to repeat the operation—it went on in cycles. So far as water supply was concerned, he imagined this state of things would never come to an end. It would not do so until all known sources of water supply in the country had been exhausted; and this time was a very long way off. Corporations would, however, be driven to more remote places for their water, and so be put to much greater cost in the future to obtain supplies. As to the 12½ per cent. added to the cost of water for risks, it would be found that, going through the kingdom, the charges to outside authorities varied from 5 per cent. to as much as 80 per cent. in excess of the authorized scale of charges obtaining within the borough. This, he took it, was in consequence of the desire to cover the supplying authority in respect of these risks, and the deficiencies which were bound to arise on the undertaking from time to time, and which could not be levied on the outside districts. In practice, instead of 12½ per cent., it more usually averaged 50 per cent.

The ARBITRATOR: I think that will include a substantial profit.

Mr. *Sidney S. Dawson*, a chartered accountant, said he had examined the tables prepared by the Borough Treasurer, Mr. Farnworth, and had heard all the evidence given. The tables were on absolutely sound lines. It was his opinion that the rates of interest for municipal loans would go increasing. If the sinking-fund contributions were deducted from the figure of 13·023d. per 1000 gallons already put in, he made the prime cost of the water 11·779d., as compared with Mr. Farnworth's adjusted figure of 11·443d. Darwen, if they paid 11·779d. per 1000 gallons, would be getting the water at the price which it cost Bolton. It would simply ensure that Bolton did not supply at a loss. In his view, the section implied that there might have been a little put on for profit; but he was instructed not to consider this. In the figure of 11·443d., interest on capital was reckoned at 3⅝ per cent., and 12½ per cent. was added for management expenses, risks, &c. The 11 779d. was arrived at by taking the interest on capital at 3¾ per cent., and reckoning management, &c., expenses at ¾ per cent. on the capital.

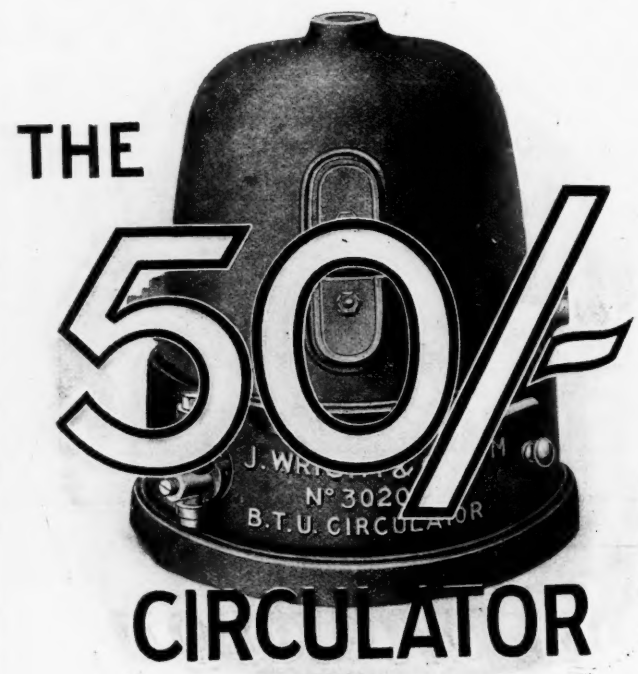
Mr. SUTTON: Supposing trade fell off, you would be able to borrow at a lower rate of interest. It depends on the amount of gold there happens to be?

Witness: The municipal debt per head and the municipal debt per pound of rateable value, it is well known, has gone up by leaps and bounds, and is likely to continue to do so. It is quite outstripping the supply.

This concluded the evidence on behalf of Bolton; and the case for Darwen (which will be noticed in an early issue) was proceeded with.

The East Pembrokeshire Gaslight and Coke Company, Limited, was registered on the 26th ult. The capital is £20,000, in £5 shares, 2000 of which are 7 per cent. preference shares.

Birmingham Gas Consumption Records.—It was reported at a meeting of the Birmingham Gas Committee early last week that the output of gas during the week ended on the previous Thursday was 267 million cubic feet. This established a record for the department, exceeding the 262 million cubic feet in the preceding week which up to that time was the record figure. In the corresponding week of last year the output amounted to 246 millions. The increase to a certain extent was due to the larger demand for gas for cookers, but chiefly to a more extensive consumption through gas-fires, caused by the intensely cold weather. The consumption during the second six months of 1913 was 255,081,900 cubic feet more than in the corresponding half of the previous year; the increase being equal to about 6 per cent.



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NOTES FROM SCOTLAND.

From Our Own Correspondents.

Saturday.

Opposition has been taken against the several Scottish Provisional Orders at present being applied for, and petitions have been lodged at the Scottish Office in London. Against the Lanarkshire County Council Order, to amend their Gas Act of 1876, besides the Burgh of Hamilton, as previously mentioned, the Carfin, Newart Hill, Cleland, and District Gas Company and the Burgh of Motherwell have lodged objections. Against the Glasgow Corporation Order, for powers regarding public lighting, the Glasgow House Owners' Association and many other public and private occupiers are objecting. The Edinburgh and Leith Gas Commissioners are petitioning against the Edinburgh and District Water Trust's proposed Order for additional works in connection with their water supply. Against the Dundee Order, for further powers for their Gas Commissioners, the three Railway Companies are appealing.

The Edinburgh and Leith Gas Commissioners are arranging for alterations to their town office for a new show-room, which is to contain model rooms, including drawing-room, dining-room, bed-room, kitchen, and bath-room. It is intended to approach several of the principal furnishing houses in the town, with the object of getting them to provide, in turns, the furnishings and decorations for the various divisions. The Commissioners would then fit up suitable lighting, heating, cooking, and hot-water appliances, which could be demonstrated under working conditions, and would convey to the public in a practical way the advantages and economies which could be derived by their utilization in consumers' own homes. Mr. Canning Williams, the Treasurer, reported that the quantity of gas sold in the summer and autumn term of 1913 showed an increase over that for the corresponding period of 1912 of nearly 38 million cubic feet, or 5·12 per cent. This represents an increase over the year 1911 of no less than 10·79 per cent.

At Kirkintilloch, eight householders have been sued by the Town Council in the Small Debt Court for various small sums which were deficient in the amounts taken by the Gas Department from the slot meters. The Sheriff upheld the contention of Mr. Patrick, the Town Clerk, that the responsibility rested upon the users of slot meters, and that they should give notice to the Gas Department on leaving one house for another, so that the money could be collected and checked. Decree was given in each case for the amount claimed.

In a number of the small towns of the North of Scotland attention is being given to the question of the supply of electric light. In Macduff, there is a private installation fitted up by a Mr. Dawson; in Insch, private enterprise again is providing a system, and is supplying certain newly-formed streets (where the Gas Company have not laid their mains) and also a number of shops. In the Burgh of Ellon, application has been made to the Board of Trade by Mr. James Duncan for a Provisional Order; and the Town Council have undertaken to use the light for the street lamps. The Burgh of Inverurie has also taken preliminary steps; and it is possible that the Railway Company may be asked to provide the current. In Forres, the Council have been making considerable inquiry, and have had the town inspected and reported on by Mr. Purves, of Edinburgh. An advertisement has been issued, inviting possible consumers of electric light to intimate their willingness to take current. The response was very small; and the general feeling seems to be that, if this light is to be introduced at all, it should be supplied by the local Gas Company, who could generate current much more cheaply than either the Town Council or an independent company. In Turriff, the subject has been mooted; but as yet nothing final has been done, as matters are waiting the reports on similar installations in other towns. Macduff, as has already been mentioned, is looking into this question, and also the sister town of Banff. The inhabitants of Fochabers received their electric light from the installation of the Duke of Richmond and Gordon. At Dufftown, it has been decided to supply gas again. The old gas-works were built in 1853, and were carried on for 39 years; but they were never a financial success, and finally, in 1892, were sold to a distillery. Since then paraffin lamps have been the principal form of illumination, although certain premises have been lighted by means of acetylene and petrol-air gas.

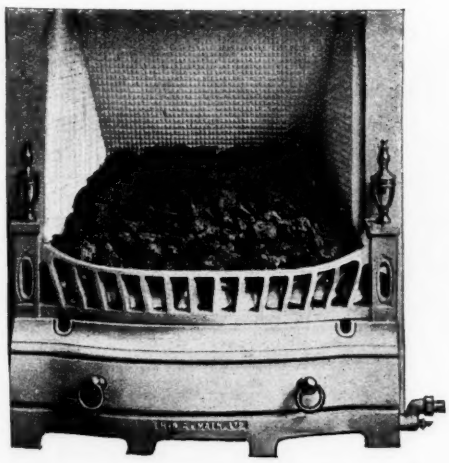
Under the Burgh Police (Scotland) Act, 1892, the Middle Ward District Committee of the County Council of Lanark have agreed to form a special lighting district, to be known as the Hamilton Road Special Lighting District, to be the same area as the present special drainage district in the parish of Dalziel. It also decided to enlarge the Carmyle lighting district so as to include South Mount Vernon and to be co-extensive with the existing special scavenging district. The estimated rate in the first case is 2d. in the pound, and in the second 3½d.

The Kirkcaldy Town Council Gas Committee have resolved to insert in the Provisional Order they are promoting a sliding-scale at the rate of 4d. per mile for the supply of gas outside the burgh boundary. If the extensions are to be of any great length, the price of gas will be prohibitive.

Failures of gas at Dumfries and of electric light at Grangemouth are reported. The former is attributed to the fitting-up of a large gas-engine at the new works of the Arrol-Johnstone Motor Company. It is being claimed that the ordinary consumer has the first call upon the supply of gas. Certainly customers who were using gas before the engine was put in have a just cause of complaint if their supply is diminished. To add to the discomfort, it was early closing day, and candles were not to be had.

Price of Gas at Steyning.—The Directors of the Steyning Gas Company have decided to reduce the price of gas from 4s. 9d. to 4s. 6d. per 1000 cubic feet. At the annual meeting of the Company, a dividend of 10 per cent., less income-tax, was declared.

Your Consumer's First Impression.



The impression made upon your consumer when he or she first sees the "St. Nicholas" Fire is most favourable.

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CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

There has been little alteration in the value of tar products during the past week, and prices remain steady at about the following figures: Creosote is firm at 3⅜d. to 3¾d. per gallon, net and naked, alongside steamer. There is a good demand for benzol at from 1s. 2d. to 1s. 2½d. net and naked. Solvent naphtha, 90-160, remains at 10¾d. per gallon, net and naked. Pyridine is 8s. 3d. per gallon, net, into buyers' drums. Sixties crude carbolic acid can be called 1s. 1d. to 1s. 1½d. per gallon, net, casks included. Anthracene 45-50 per cent. is still 2d. per unit, net, casks free. Good business continues to be done in freed tar for home use; and pitch is quoted at 41s. per ton net. Ninety per cent. toluol is 1s. per gallon, net and naked.

Sulphate of ammonia 25 per cent. could not to-day be called higher than £11 15s. per ton; and it is possible that to induce business at the moment a slightly lower figure would have to be accepted.

Manchester Tar Prices.

It is officially announced that the average price realized for December deliveries of tar in the Manchester district—based on the value of the products—was 33s. 4d. per ton.

Tar and Tar Products in the Provinces.

The average values during the week were: Tar, 27s. to 31s. Pitch, east coast, 38s. 6d. to 39s. 6d.; west coast, Manchester, 38s. 6d. to 39s. 6d.; Liverpool, 39s. to 40s.; Clyde, 38s. 6d. to 39s. 6d. Benzol, 90 per cent., naked, North, 11½d. to 1s.; 50-90 per cent., naked, North, 11d. Toluol, naked, North, 10¾d. to 11d. Crude naphtha, in bulk, North, 5d. to 5¼d. Solvent naphtha, naked, North, 9¼d. to 9¾d. f.o.b. Heavy naphtha, naked, North, 9d. to 9¼d. f.o.b. Creosote, in bulk, North, 3d. to 3¼d. Heavy oils, in bulk, 3⅜d. to 3⅝d. Carbolic acid, casks included, 60 per cent., prompt, east and west coasts, 1s. 0½d. to 1s. 1d. Naphthalene, £4 10s. to £10; salts, 55s. to 60s., bags included. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

Sulphate of Ammonia Prices in the Provinces.

LIVERPOOL, *Jan.* 31.

During the past week the tone of the market for this material has become dull again, and the slight improvements recorded a week ago have been lost. January requirements having all been covered, buyers have evidently been content to await further developments before committing themselves for later delivery. The closing values are £12 5s. per ton f.o.b. Hull, £12 6s. 3d. per ton f.o.b. Liverpool, and £12 7s. 6d. per ton f.o.b. Leith. There is little doing in the forward position, owing to the fact that buyers now expect to contract at a discount and producers still require a premium on prompt prices.

Nitrate of Soda.

This article has remained unaltered in either tone or value, and quotations are repeated at 10s. 4½d. and 10s. 7½d. per cwt. for ordinary and refined quality respectively, on spot.

From another source it is reported that the market has been steadier during the past week, and the fall seems to have stopped. However, there is practically no change as regards price, and there still appears to be plenty of material to meet the demand. Outside London makes are quoted at £11 10s.; Hull, £12 5s.; Leith, £12 7s. 6d.; Liverpool, £12 5s. to £12 6s. 3d.; Middlesbrough, £12 5s.

"Additional Fortunes" for Colliery Proprietors.

In an article in the "Daily Telegraph" last week on the strike of coal porters and carmen in London, it was stated that one of the workers had said that the profits of the coal merchants would not stand an extra charge for wages, and that under existing circumstances more than one prominent firm were unable to pay a dividend on their ordinary shares. "On the other hand, another prominent merchant admitted that the colliery proprietors have been doing extremely well. 'An erroneous opinion appears to exist among the public—and particularly, perhaps, with workers in the coal trade,' said this gentleman, 'that enormous profits are being made by merchants. It is true that colliery proprietors are, in certain cases, gathering in huge returns on their coal—the owners of certain classes of coal that is in demand—and that several of them made additional fortunes as the result of the national strike of a year and more ago. But it is not true of the merchants, factors, and purveyors. With many of these a 10 or 12 per cent. increase in wages would have meant the verge of bankruptcy.'"

Walker and Wallsend Union Gas Company.—The Directors of this Company report that the receipts from the sale of gas and residuals in the past year were the highest recorded. The total revenue was £51,533, and the expenditure £36,931; leaving a balance of £14,602. The amount available for distribution is £24,851. After paying interest on mortgages, &c., and placing £1500 to the credit of the insurance fund, the Directors propose to pay dividends for the past half year at the rates of £4 12s. 6d. and £6 2s. 6d. per cent. per annum, less income-tax, on the 3½ and 5 per cent. stocks. These, with the interim dividends at the same rates paid to the 30th of June last, and the two payments previously referred to, will absorb £13,291, and leave £11,560 to be carried forward. There was an additional expenditure of £5958 on capital account last year, chiefly for the provision of coke-handling plant.

DAVIS

The Standard Hygienic Gas Fire

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COAL TRADE REPORTS.

Northern Coal Trade.

There are still very heavy shipments of coal from the northern ports; but the consumption of some kinds is now rather lessening. In the steam coal trade, best Northumbrians vary from 14s. 3d. per ton f.o.b. for prompt delivery down to 13s. 6d. for delivery late in February. Second-class steams are about 11s. 9d. per ton f.o b.; and steam smalls are quiet at 6s. to 7s. 9d. per ton, but with a rather fuller tendency for export. In the gas coal trade, the deliveries on the long contracts continue heavy, though they are being reduced. Best Durham gas coals are from 13s. 6d. to 13s. 9d. per ton f.o.b.; and second-class coals are about 12s. 6d. to 12s. 10d. "Wear specials" are steady at 13s. 7½d. to 14s. per ton f.o.b. The good demand for Durham bunker coal has its influence on the gas coal trade. It will be seen, however, that prices are easier for Durham gas coals; and this has the effect of making forward buyers hold off as far as possible. Contracts for some 30,000 tons of gas coal for Kiel are in the market, as well as some smaller lots for Scandinavian ports. In most of these cases there will be the benefit to the buyers of sea-freights that are much below those which ruled when similar contracts were made a year ago. Coke is steady generally. Gas coke is in fair demand, and from 13s. 6d. to 13s. 9d. f.o.b. in the Tyne is near the current quotation for good makes.

Pudsey Gas Company.—In the report presented by the Directors of this Company at the annual meeting yesterday, they stated that there had been an increase of 4 per cent. in the sales of gas in 1913 as compared with the preceding year. The revenue was £26,869, and the expenditure £20,395; leaving £6474 to go to the profit and loss account. The amount available for distribution was £3896. An interim dividend at the rate of 9 per cent. per annum was paid on the new consolidated 7 per cent. stock last August; and the Directors recommended a dividend for the past half year at the same rate.

Two Drunken Seamen Poisoned by Gas.—The East London Coroner held an inquest last Thursday at the Poplar Coroner's Court on the bodies of Gustav Hallberg (29), able seaman, and Karl Georg Arronsen (39), a ship's greaser, both natives of Sweden, lately staying at the Scandinavian Home, Garford Street, Poplar. It was stated in evidence that the men arrived at the home from different ships on the 16th ult. On Wednesday night they were out with two others, and returned very much the worse for drink. They remained up drinking and playing cards in their room. At 12.30 the gas was turned off at the main, and turned on again at 6.30 a.m. About 11.30 the housemaid found one man lying across a chair, face downwards, and the other on one of the beds. The room was full of gas, and the tap of the burner was fully on. Death in each case was due to coal gas poisoning. The Jury returned a verdict of "Accidental death, the result of gas being left turned on during a drunken bout."

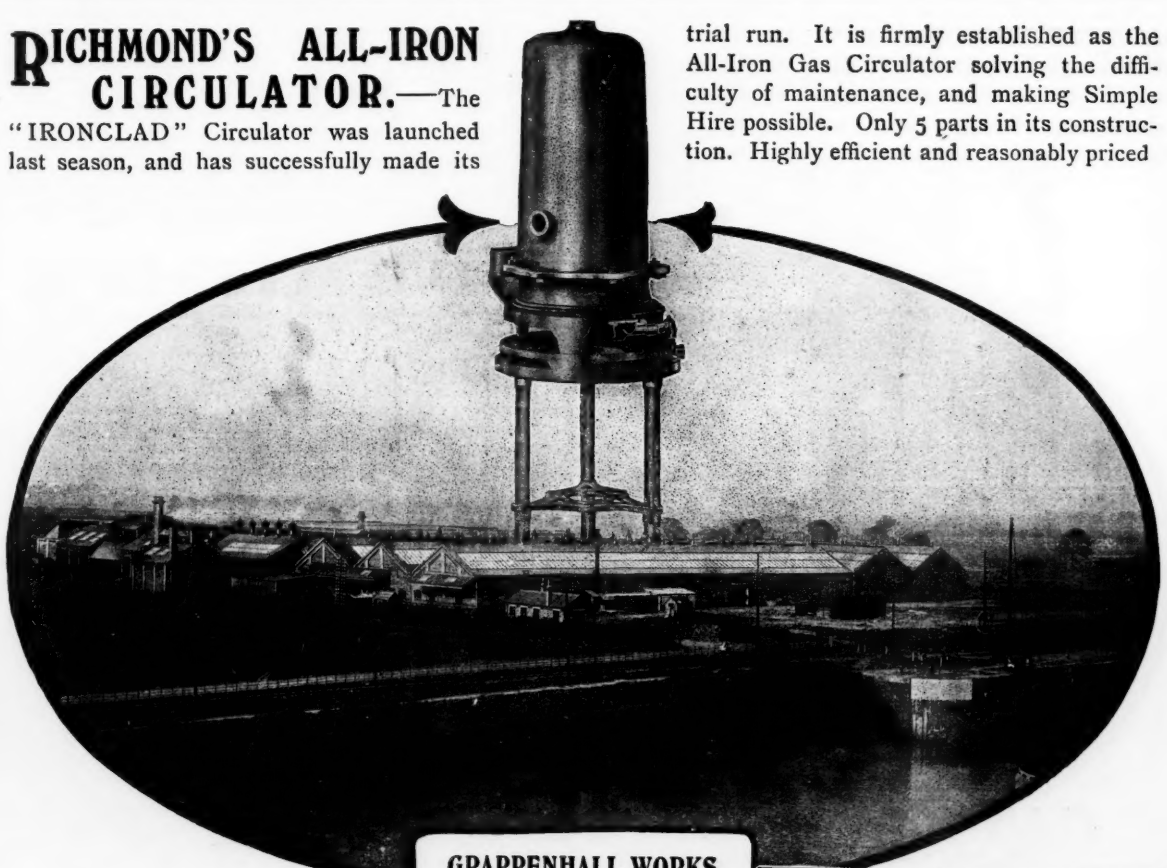
High-Pressure Gas at Leicester.

A report was submitted by the Gas Committee at a meeting of the Leicester Town Council last week to the effect that they had resolved to lay an extra high-pressure gas-main encircling practically the whole of the borough. At present there was no connection between the two works except through the distributing system; and it was not therefore practicable for the works to assist each other. There was difficulty in maintaining the pressure of gas in the outskirts of the town, particularly on the northern and eastern sides. The estimate of the Engineer (Mr. Hubert Pooley) was £24,602. The necessity for some such scheme as this had been forced upon the mind of the Engineer soon after his appointment. The principal object of the new main was to perfect the supply throughout the borough, especially in the north-east part. It had been necessary in many parts of the town to put in new mains, so as to cope with the additional pressure required. Another point was that there would be better intercommunication between the two works, which in towns of the size of Leicester was highly important; for it made it possible for gas to be pumped from Belgrave to Aylestone and *vice versâ*. It would also enable the Council to initiate the system of high-pressure lamps in the streets as in London. Further, the work would use up the surplus labour which would be displaced very shortly by the introduction of the vertical retort system. The first section, from the Belgrave works to the Aylestone works, would cost £11,987, and would take about two years to complete; and the compressors which would have to be purchased would cost £3000. The second section would cost a further £8443. The project was approved.

Melbourne Metropolitan Gas Company.—We learn from Messrs. John Terry and Co., the agents of the above-named Company, that they have received advice by cable to the effect that the profits for the six months ended the 31st of December last were £111,000. A dividend of 6s. 6d. per share has been declared for the half year, a sum of £35,000 has been added to the reserve fund, and a balance of £63,500 carried forward.

Aldershot Gas, Water, and District Lighting Company.—At the forthcoming half-yearly meeting of this Company, the Directors will report a surplus of £9743 on the working in the six months ended the 31st of December. There is a profit balance of £18,197; and they will recommend dividends for the half year at the rates of 6·2, 4·7, and 5 per cent. per annum respectively on the "A," "B," and "C" stocks, all less income-tax. Exclusive of works and special contracts, the sales of gas increased by 7·2 per cent.; and it is pointed out that this is a significant appreciation by the consumers of the reduction in the price of gas operating over the whole of 1913, representing a saving to the consumers of nearly £1600 per annum. The Directors state that co-partnership, which has been two years in existence in the Company, is appealing to the employees. It is expected that a supply of electricity will be available in the early autumn.

RICHMOND'S ALL-IRON CIRCULATOR.—The "IRONCLAD" Circulator was launched last season, and has successfully made its trial run. It is firmly established as the All-Iron Gas Circulator solving the difficulty of maintenance, and making Simple Hire possible. Only 5 parts in its construction. Highly efficient and reasonably priced



GRAPPENHALL WORKS, WARRINGTON.
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Thomas Fletcher the Pioneer.

Under the auspices of the Warrington and District Smoke Abatement League, Professor Vivian B. Lewes has been lecturing on one of his favourite subjects—atmospheric purity. Warrington required a little admonition and instruction on the subject of the pollution of the atmosphere, as, according to the President of the League (Mr. C. E. Parker), one of the delusions that exist there is that smoke is a necessary concomitant of prosperity. Professor Lewes was as usual highly interesting; and in one place, he made an acknowledgment as to the pioneer work that had come out of Warrington in furthering the cause of smokeless heating. Just one extract from this part of the lecture. The Professor said: I do not know why I should be arguing with a Warrington audience on the enormities of smoke production. I really ought to have taken as my motto, "Charity begins at home," because I can assure you that Warrington has done more towards reducing the smoke of England than any other town in the country. But, like the shoemaker's wife, it has been the worst shod—or, at any rate—jolly badly shod. Here you have in Warrington the works of Messrs. Fletcher, Russell, and Co., who were the pioneers in the introduction of gas fuel. I remember old Thomas Fletcher, a genius in his way, and one of the finest men who ever lived. It was he who, introducing gas-stoves of a superior pattern to those brought out, caused the introduction of gaseous fuel for domestic heating to be largely taken up in London. During the last five or six years the enormous improvements in gas-stoves have led to one-sixth of the chimneys in London ceasing to emit smoke, because fire grates have been converted into gas-burning grates. This has brought about a really marvellous change in the air of London. At the conclusion of the lecture, a vote of thanks was passed to Professor Lewes on the motion of Mr. J. A. Ransome.

Northwich Water Bill.—In consequence of a requisition signed by over a hundred ratepayers, a poll of the electors of Northwich was recently taken, to decide whether the Urban District Council shall promote a Bill in the next session of Parliament to obtain powers to supplement the town's supply of water from Cote Brook, at a cost not exceeding £20,000, and to give additional public health powers. The result of the poll was largely in favour of the promotion of the Bill; the figures being: For, 1065; against, 231.

Eastbourne Electric Light Failures Sequel.—The failures which occurred about Christmas time in the electric light supply at Eastbourne have a sequel in the report of the Electric Lighting Committee, which records the receipt of a letter from Messrs. Bruford and Son stating that they have installed gas in their shop as a precaution in case of future breakdowns of the electric lighting, and they propose to render the account therefor to the Corporation. The Committee resolved that, while regretting the inconvenience which occurred, they cannot admit any liability in the matter.

Gas-Worker's Unsuccessful Claim.

In the Blackburn County Court last week, James R. Graham sought to recover compensation from the Accrington and District Gas and Water Board in respect of an accident he sustained while following his employment at the Great Harwood Gas-Works. Plaintiff stated that in March last he was filling boxes with oxide in the purifying-house, when an empty box which was being hooked to a rope in the room above fell through a trap-door, striking him on the shoulder and side of the head. He was at home for three days, and then returned to do light work. Subsequently he had to give the work up, on account of severe pains in the head. For the defence it was contended that the box struck the man on the shoulder, and not on the head. There was also a preliminary objection to the applicant obtaining any award on the ground that the terms of the Workmen's Compensation Act had not been complied with in reference to the notice to the Gas and Water Board. Judge Sturges found that the applicant had failed to make a claim within the six months required by the Act, and gave a verdict for the Board.

Mossley Gas-Workers' Demands.—Through the medium of Mr. P. J. Tevenan, General Secretary of the Municipal Employees' Association, application has been made for an advance in the wages of the employees in the gas-works; lighting and sanitary men being also included in the programme. The reason advanced for the demand is the increased cost of living.

Burnley Gas-Workers' Demands.—A meeting of the Burnley branch of the National Union of Gas-Workers and General Labourers was held last week, when the recent concessions of the Gas Committee were considered. After some discussion, it was decided to ask the Committee to reconsider several questions of a minor nature, and the establishment of a minimum rate of 6½d. per hour for labourers. Taken generally, however, the concessions were considered in a favourable light, although the question of overtime remains a contentious point. The men made demands aggregating nearly £2300; and the advances conceded amounted to about £1000. At a subsequent meeting of the General Purposes Committee, the recommendations of the Gas Committee [see *ante*, p. 246] were approved. Councillor Irving, however, moved an amendment that labourers' wages should be 6½d. instead of 6¼d. per hour; but the proposition was defeated after it had been explained that the Committee could not see their way to pay the additional farthing per hour. In the course of the discussion it transpired that the financial results of the Gas Department during the present financial year were much below expectations. Alderman Emmott (Chairman of the Gas Committee) explained that the Committee had been faced with the increased cost of materials on the one hand and the low price of residuals on the other. At the conclusion of the proceedings it was stated that no official intimation had been received from the Gas-Workers' and General Labourers' Union as to the proposed concessions.

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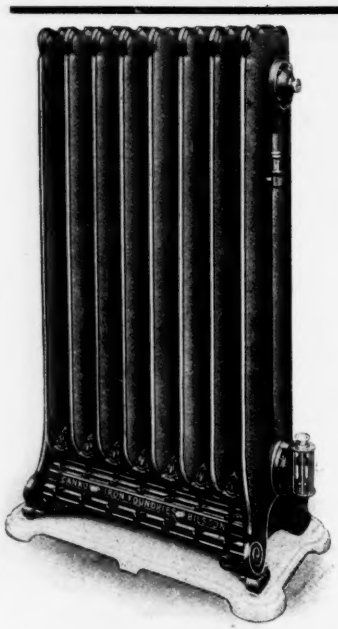

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Lambeth Borough Council and Gas Bills.

At a meeting of the Lambeth Borough Council on Friday, a further report by the Town Clerk was considered with reference to the Gaslight and Coke Company's Bill. He pointed out that by the principal provisions of the Bill the Company, in consequence of the almost universal adoption of incandescent burners for the consumption of gas for lighting purposes, sought to be relieved of their existing obligation to supply gas for illuminating purposes of the prescribed illuminating power of 14 candles, but it was proposed that a standard calorific power of gas supplied by the Company should be set up. On his statement that "Parliament had granted exactly the same relief to the South Suburban Gas Company, by the South Suburban Gas Act, 1912, to which the Council raised no objection," it was decided to take no action with regard to the Bill. The Council also determined to take no action with reference to the South Suburban Gas Company's Bill. The Clerk reported that the Company did not mean to execute any works or break-up any streets in the borough, and that the proposals to generate and sell electricity must be confined to Erith.

Porthcawl Gas Purchase Question.—A lengthy discussion took place at last week's meeting of the Porthcawl Urban District Council on the question of the proposed gas clauses in their Omnibus Bill. A memorial was presented in favour of the Council ordering a poll of the district on the purchase of the gas undertaking being included in the Bill; while the opposition also handed in a petition asking for a poll. On a division, six voted for a poll, and two against.

Carriage of Coal to Exeter.—"It is gratifying to learn," says the "Exeter Express and Echo," "that the 1500-ton steamer with coal for the Exeter Gas Company visited the Bight, discharged into barges in the space of 62 hours, and left. The steamer is expected again towards the end of next week. All this indicates that the new plan of conveying coal to the gas-works is a complete success. First came a steamer of 1000 tons; and this has been replaced by one carrying half as much coal again, and the service is as regular as could possibly be desired. Thus, the trade of the Gas Company would appear to be permanently secured for the canal."

Newmarket Gas Company.—The report of the Directors which will be submitted at the meeting of the Company on the 16th inst. states that the net balance of profit earned during the year ended Dec. 31 is £4808, which, after deducting debenture interest, and adding £3742 the balance brought forward from the last accounts, makes a sum of £8387 now standing at the credit of profit and loss. A dividend is recommended upon the original consolidated stock at the rate of 6¾ per cent., less income-tax, and that £3944 be carried forward. During the year, the Directors adopted a scheme for extending to the regular employees of the Company the benefits of co-partnership and profit-sharing; and the employees have unanimously adopted the proposals. There is, the Board add, every reason to believe the scheme will work to the mutual advantage of the Company and their servants.

APPLICATIONS FOR LETTERS PATENT.

1406.—Hutton, E. A., "Strengthening mantles." Jan. 19.

1415.—Burkheiser, K., "Removal of sulphuretted hydrogen from coal gas." Jan. 19.

1557.—Grafton, A., "Burners for gas-fires." Jan. 20.

1574.—Wilson, J. H. & G., "Gas-meters." Jan. 20.

1675.—Anderson, J., "Control of gas-lamps." Jan. 21.

1692.—Koller, K., "Gas-generators." Jan. 21.

1700.—Holman, S., "Retort-lids." Jan. 22.

1737.—Milne, J., and Son, Ltd., Fox, T., and Oliver, F. R., "Gas-meters." Jan. 22.

1753.—Brook, F. H., "Valves and cocks." Jan. 22.

1760.—Campbell, F. W., "Incandescent burners." Jan. 22.

1775.—Battey, S. A., and Moore, J. C., "Meters." Jan. 22.

1806.—Fisk, J. W., "Mantles." Jan. 23.

1820.—Twynam, T., "Utilization of coke-oven gas, and the recovery of bye-products." Jan. 23.

1913.—M'Kie, M., "Lighting gas-lamps." Jan. 24.

1928.—Cunnington, G. H., "Gas-stoves." Jan. 24.

1978.—Brown, W. L., "Meters." Jan. 24.

Mr. John Durant, who is a pensioned employee of the South Metropolitan Gas Company, who resides at Weybridge, was 104 years old yesterday.

Among contracts recently secured by Messrs. Edward Bennis and Co., Limited, are two stokers and self-cleaning furnaces for the waterworks of the Hitchin Urban District Council.

Some unrest prevails in the Great Harwood district among the mill operatives, because of the conditions under which they work when the mills are illuminated; the result being that the Great Harwood Weavers' Association have decided to lodge complaints with the employers. The operatives state that in the gaslight it is difficult for them to see, and, further, that the smell of the gas had recently become offensive. Some workpeople have complained that they have actually been made ill. At the last meeting of the Great Harwood District Council, Mr. Allsopp reiterated the complaint, and said the people of the district would "revolt" against it if some improvement were not speedily forthcoming. The Chairman said he had been assured by the Manager of the gas-works that every effort would be made to bring about an improvement in the quality of the gas supplied. The district is supplied with gas by the Accrington and District Gas and Water Board.

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(BRANCH OF METERS LTD.)

MILES PLATTING, MANCHESTER, RADFORD ROAD, NOTTINGHAM.

GAS COMPANIES IN THE STOCK EXCHANGE.

The extraordinary revival of strength and activity in the Stock Markets which characterized the previous week was altogether surpassed and left far behind last week. Not only the extent to which prices have advanced, but the rapidity of their rise day after day, has been almost bewildering. Nothing like it could have been dreamt of by the most sanguine optimist. The key of the position was the fall in the value of money; and the rapidity of its fall is probably beyond the memory of the present generation. On Jan. 7, the Bank rate was 5 per cent., and on the 29th it was 3 per cent. The demand for investment has been enormous; and seemingly it is not yet satisfied. The opening day gave no sign of what was imminent. Business was quiet and cautious, and the general tone betrayed weakness. Prices in most markets fell; and though a recovery set in before the close, it came too late to wipe out losses. Government issues stood best, and Consols even gained $\frac{1}{8}$. Tuesday saw a complete change, and was most cheerful, with strong and active markets. All the gilt-edged division were most conspicuous in advance. Consols rose $\frac{5}{8}$, Rails were quite buoyant, and Colonials improved on Home and Continental support. On Wednesday, the continuous upward movement proceeded with scarcely a cloud upon the horizon except the American. Consols gained $\frac{1}{4}$, Rails were in excellent form, except for a disappointing dividend announced by one line, and there was an almost general upward move in Gas prices. Thursday was an even more astonishing day. Aided by a further reduction in the Bank rate, markets fairly revelled in activity and buoyancy. The gilt-edged was about the best of all, and Consols actually rose $1\frac{1}{8}$. All the rest followed suit more or tess, except Americans. Business on Friday was still active. Markets were generally firm, and some even higher, in spite of inevitable realizations. Consols did not move, but several other Government issues advanced. Rails were a little tamer; but the Foreign Market was strong. On Saturday, the activity was maintained far beyond the usual measure, and markets in general were strong. American fell into line with the rest. Consols closed at $75\frac{3}{4}$ to $76\frac{1}{4}$—a rise of $2\frac{1}{8}$ in the week. The extraordinary ease of the Money Market was shown by the reduction of the Bank rate by 2 per cent. in three weeks. This is, perhaps, a record. Business in the Gas Market was a moderate average in point of volume; and the general tone of the Stock Exchange was reflected not only by advanced prices all round, but especially by a welcome recovery in the debenture stocks. In Gaslight and Coke issues, the ordinary was in excellent form, and advanced from $102\frac{1}{4}$ to $106\frac{1}{2}$—a rise of 3. In the secured issues, the maximum realized $76\frac{1}{2}$, the preference 95 to $97\frac{3}{4}$ (a rise of 2), and the debenture 72. South Metropolitan was quiet and strong at 111 to 114 (a rise of $1\frac{1}{2}$), and the debenture made 72 and 73. In Commercials, the 4 per cent. stock realized $106\frac{1}{2}$ to $107\frac{1}{4}$, the $3\frac{1}{2}$ per cent. 105 and $105\frac{1}{4}$, and the debenture 73—an advance in each. Among the Suburban and Provincial group, Brentford preference marked 112, British 45, South Suburban 117 (a rise of 1), Wandsworth "B" 135 (a rise of 2), ditto "C" 116, and (on the local Exchange) Newcastle 101—a rise of $\frac{1}{2}$. In the Continental companies, Imperial changed hands at 175 and 176 (a rise of 2), Union preference at $118\frac{1}{2}$, and European at $17\frac{7}{8}$ to $17\frac{15}{16}$—a rise of $\frac{1}{4}$. Among the undertakings of the remoter world, Bombay fetched $6\frac{3}{8}$, Monte Video, $11\frac{11}{16}$, Primitiva $5\frac{3}{4}$ to $6\frac{5}{16}$, ditto preference $4\frac{7}{8}$ to $5\frac{1}{16}$, San Paulo preference $10\frac{7}{8}$ to 11, and ditto debenture 48—a rise of 1.

OFFICIAL QUOTATIONS AT THE CLOSE OF THE WEEK.

Bank Rate (fixed January 29), 3 per cent. Last year, 5 per cent. Consols, $75\frac{3}{4}$—$76\frac{1}{4}$. Previous week, $73\frac{3}{4}$—74.

Issue.	Share.	When ex. Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.	Issue.	Share.	When ex. Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.	£			p.c.				£ s. d.
1,551,868	Stk.	Oct. 15	4	Alliance & Dublin Ord.	56–60	..	6 13 4	75,000	5	Dec. 11	6	Malta & Mediterranean	4⅜–4⅞	..	6 3 1
374,000	,,	Jan. 15	4	Do. 4 p.c. Deb.	78–81	..	4 12 9	250,000	100	Oct. 1	4½	Met. of Melbourne 4½ p.c. Deb.	97–99	..	4 10 11
280,000	5	Oct. 15	7½	Bombay, Ltd.	6–6½	..	5 15 5								
50,000	10	Aug. 28	15	Bourne-mouth Gas and Water 10 p.c. Pref. 6 p.c.	28½–29½	..	5 2 2	541,920	20	Nov. 27	4	Monte Video, Ltd.	11⅝–12⅛	..	6 10 8
347,500	10	,,	7		14⅜–15⅛	..	4 11 10	1,775,892	Stk.	July 30	4½	Newc'tle&G'tesh'd Con.	100½–101½	+½	4 8 8
75,000	10	,,	6		13½–18⅝	..	4 7 3	529,705	Stk.	Dec. 30	5½	Do. 3½ p.c. Deb.	£2½–83	..	4 4 4
380,000	Stk.	Aug. 14	14	Brentford Consolidated	263–268	+1	5 4 6	55,940	10	Aug. 28	7/10,6	North Middlesex 7 p.c.	12⅛–13½	..	5 11 5
330,000	,,	,,	11	Do. New	204–209	+1	5 5 3	300,000	Stk.	Nov. 27	8	Oriental, Ltd.	120–125	..	6 8 0
50,000	,,	,,	5	Do. 5 p.c. Pref.	111–113	..	4 8 6	60,000	5	Sept. 26	10	Ottoman, Ltd.	7⅞–8½	..	6 3 1
206,250	,,	Dec. 11	4	Do. 4 p.c. Deb.	93–95	+2	4 4 3	60,000	50	Aug. 14	13	Portsea, Island B	130–133	..	4 17 9
217,380	Stk.	Aug. 28	11	Brighton & Hove Orig.	201–206	..	5 6 10	100,000	50	,,	12	Do. C	120–123	..	4 17 7
244,200	,,	,,	8	Do. A Ord. Stk.	149–152	..	5 5 3	249,980	5	Oct. 15	8	Primitiva Ord.	5⅞–6⅜	+⅛	6 5 6
530,000	20	Sept. 26	12½	British	44⅛–45⅛	..	5 9 11	499,960	5	Dec. 30	5	,, 5 p.c. Pref.	4 1/16–5 3/16	+⅛	4 16 6
120,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb. Stk.	85–87	..	4 12 0	521,600	100	Dec. 1	4	,, 4 p.c. Deb.	92–94	..	4 5 1
245,771	Stk.	,,	4	Buenos Ayres 4 p.c. Deb.	89–91	..	4 7 11	346,198	Stk.	Dec. 30	4	River Plate 4 p.c. Deb.	87–89	..	4 9 11
100,000	10	—	—	Cape Town & Dis., Ltd.	2–3	..	—	275,000	5	Sept. 26	12	San Paulo, Ltd.	—	..	—
100,000	10	—	—	Do. 4½ p.c. Pref.	2½–4½	..	—	150,000	10	,,	6	Do. 6 p.c. Pref.	10⅞–11⅞	..	5 5 6
100,000	Stk.	Dec. 30	4½	Do. 4½ p.c. Deb. Stk.	73–78	..	5 15 5	125,000	50	Jan. 2	5	Do. 5 p.c. Deb.	48–50	+1	5 0 0
157,150	Stk.	Aug. 14	5	Chester 5 p.c. Ord.	109–111	..	4 10 1	135,000	Stk.	Aug. 28	10	Sheffield A	222–224	..	4 9 8
1,513,280	Stk.	Aug. 28	5/9/4	Commercial 4 p.c. Stk.	107–109	+1	5 0 3	209,984	,,	,,	10	Do. B	221–223	..	4 9 8
560,000	,,	,,	6½	Do. 3½ p.c. do.	105–107	+1½	4 19 8	523,500	,,	,,	10	Do. C	220–222	..	4 10 1
475,000	,,	Dec. 11	8	Do. 3 p.c. Deb. Stk.	71–73	+1	4 2 2	90,000	10	Oct. 15	7½	South African	9½–10½	..	7 2 10
800,000	Stk.	,,	4½	Continental Union, Ltd.	79–82	..	5 9 9	6,429,895	Stk.	Aug. 14	5/9/4	South Met., 4 p.c. Ord.	113–114	+1½	4 15 10
200,000	,,	,,	7	Do. 7 p.c. Pref.	115–120	..	5 16 8	1,895,445	,,	Jan. 15	3	Do. 3 p.c. Deb.	71½–73½	..	4 1 8
492,270	Stk.	—	7⅜	Derby Con. Stk.	123–125	..	4 12 0	209,820	Stk.	Aug. 14	8½	South Shields Con. Stk.	157–159	..	5 6 11
55,000	,,	—	4	Do. Deb. Stk.	102–104	..	3 16 11	952,795	Stk.	,,	6	S'th Suburb'n Ord. 5 p.c.	116–118	+1	5 1 8
1,002,180	10	Jan. 15	10	European, Ltd.	17–18	+¼	5 11 1	60,000	,,	,,	5	Do. 5 p.c. Pref.	112–114	..	4 7 9
16,386,660	Stk.	Aug. 14	4/17/4	Gas-light and Coke 4 p.c. Ord.	104½–106½	+3	4 11 6	117,058	,,	Dec. 30	5	Do. 5 p.c. Deb. Stk.	113–115	..	4 6 11
2,600,000	,,	,,	8½	3½ p.c. max.	75–78	..	4 9 9	594,740	Stk.	Nov. 13	5	Southampton Ord.	101–104	+1	4 16 2
4,062,235	,,	,,	4	4 p.c. Con. Pref.	96–99	+2	4 0 10	120,000	Stk.	Aug. 14	7⅜	Tottenham District A 5 p.c.	138–141	+1	5 4 7
4,674,850	,,	Dec. 11	8	3 p.c. Con. Deb.	71–73	..	4 2 2	543,940	,,	,,	5⅜	B 3½ p.c.	116–118	+1	4 19 6
258,740	Stk.	Sept. 11	5	Hastings & St. L. 3½ p.c.	90–92	..	5 8 8	149,470	,,	Dec. 30	4	4 p.c. Deb.	89–91	+1	4 7 11
70,000	10	Oct. 15	11	Hongkong & China, Ltd.	163–171	..	6 7 6	182,380	10	,,	5	Tuscan, Ltd.	5–6	..	8 6 8
131,000	Stk.	Sept. 11	7⅛	Ilford A and C	150–153	..	4 19 8	149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	95–97	..	5 3 1
65,780	,,	,,	6⅛	Do. B	118–120	..	5 2 1	236,476	Stk.	Aug. 14	5	Tynemouth, 5 p.c. max.	111–113	..	4 8 6
65,500	,,	Dec. 30	4	Do. 4 p.c. Deb.	89–91	+2	4 7 11					Wandsworth, Wimbledon, and Epsom—			
4,940,000	Stk.	Nov. 13	9	Imperial Continental	173–178	+2	5 1 1								
1,235,000	Stk.	Aug. 14	8¼	Do. 3½ p.c. Deb. Red.	83½–85½	..	4 1 10	30,000	Stk.	Aug. 28	8⅜	Wandsworth A 5 p.c.	155–160	..	5 4 8
200,242	Stk.	Aug. 28	6½	Lea Bridge Ord. 5 p.c.	118–121	..	5 3 4	255,636	,,	,,	6⅞	,, B 3½ p.c.	132–137	+2	5 0 4
561,000	Stk.	,,	10	Liverpool United A	209–211	..	4 14 9	108,075	,,	,,	5/17/8	,, C 3½ p.c.	112–117	..	5 0 3
718,100	,,	,,	7	Do. B	145–147	..	4 15 3	352,000	,,	,,	6⅛	Wimbledon 5 p.c.	111–116	..	5 5 7
306,083	,,	Dec. 30	4	Do. Deb. Stk.	95–97	+2	4 2 6	98,000	,,	,,	6⅜	Epsom 5 p.c.	115–120	.	5 10 5
63,480	Stk.	Dec. 30	3	Maidstone 3 p.c. Deb.	65–67	..	4 9 7	88,416	,,	Dec. 30	3	3 p.c. Deb. Stk.	68–70	+1½	4 5 9

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

GAS MANAGER. Margam Urban District Council. Applications by Feb. 14.
JUNIOR SALESMAN. Weston super-Mare Gas Company.
WORKING MANAGER. Tetbury Gas Company.
GAS FITTER AND RELIEF MANAGER. Devon Gas Association.
STOKER. No. 5843.

Appointments, &c., Wanted.

MANAGEMENT OF PURCHASING BRANCH (GLASSWARE AND LIGHTING) AT GABLONZ. No. 5841.

Books Wanted.

CRIPPS' GUIDE-FRAMING OF GASHOLDERS. No. 5840.

Gas-Works Wanted.

"D. G.," SCRIPPS'S ADVERTISING OFFICES, 13, South Molton Street, W.

Plants, &c. (Second-Hand), for Sale.

BLOWING PLANT. Scarborough Gas-Works.
TANK, GASHOLDER, &c., PURIFIERS, GOVERNOR. Romford Gas Company.

Plant, &c. (Second-Hand), Wanted.

CONDENSERS. No. 5842.

Meetings.

BRENTFORD GAS COMPANY. St. Ermin's Hotel. Feb. 13. 2.30 o'clock.
BRIGHTON AND HOVE GAS COMPANY. 5, Great Winchester Street, E.C. Feb. 20. Two o'clock.
HORLEY GAS COMPANY. Great Eastern Hotel, London, E.C. Feb. 26. 3.30 o'clock.

Patent Licences.

GAS PRODUCER. Haseltine, Lake, and Co., Southampton Buildings, W.C.

Sales of Stocks and Shares.

BOURNEMOUTH GAS AND WATER COMPANY. London Mart. Feb. 24.

TENDERS FOR

Coal.

LANCASTER GAS DEPARTMENT. Tenders by Feb. 14.
MILFORD HAVEN URBAN DISTRICT COUNCIL. Tenders by Feb. 14.

Cookers.

BARROW-IN-FURNESS CORPORATION. Tenders by Feb. 17.

Fire-Clay Goods.

BARROW-IN-FURNESS CORPORATION. Tenders by Feb. 17.
HALIFAX GAS DEPARTMENT. Tenders by Feb. 18.

General Stores (Lamp Fittings, Cocks, Oils, Paints, Lime, Ironmongery, Sulphuric Acid, Steel Goods, Gaskin, Brooms, Galvanized Iron and Tin Sheets, &c., &c., Scrap Metal).

BARROW-IN-FURNESS CORPORATION. Tenders by Feb. 17.
HALIFAX GAS DEPARTMENT. Tenders by Feb. 18.

Meters.

BARROW-IN-FURNESS CORPORATION. Tenders by Feb. 17.
HALIFAX GAS DEPARTMENT. Tenders by Feb. 18.

Oxide of Iron.

HALIFAX GAS DEPARTMENT. Tenders by Feb. 18.

Pipes, Valves, &c.

BARROW-IN-FURNESS CORPORATION. Tenders by Feb. 17.
HALIFAX GAS DEPARTMENT. Tenders by Feb. 18.

Retort Mouthpieces.

WARRINGTON GAS DEPARTMENT. Tenders by Feb. 14.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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"VOLCANIC" FIRE CEMENT.
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THE very best Patent Grids for Holding Oxide Lightly.
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WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS AND GOVERNORS.
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For Prices, &c., apply to
THE GAS LIGHTING IMPROVEMENT CO., LTD.
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TAR Wanted.
FREDK. G. HOLMES AND CO., Tar Distillers, Thames Tar Works, NORTHFLEET.

IT'S IN THE JOINTING.
High Pressure Mains must be absolutely TIGHT.
WE GUARANTEE OUR WORK.
Lead Wool, Oxy-Acetylene Welded, or Ordinary Jointing.
COMPLETE HIGH PRESSURE SCHEMES.
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EDWARD COCKEY & SONS, LTD.,
Supply
COMPLETE CARBONIZING PLANTS,
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SPIRAL OR STANDARD GUIDED GAS-HOLDERS.
Prices and Designs on Application to
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THE MOST EXTENSIVE RANGE OF RECORDING INSTRUMENTS IN THE WORLD.

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Recording Pressure Gauges.
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Indicating and Recording Electric Pyrometers for Water Gas Plants.

AMMONIACAL Liquor Wanted.
CHANCE AND HUNT, LTD., Chemical Manufacturers, OLDBURY, WORCS.
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"GAZINE" (Registered in England and Abroad). A radical Solvent and Preventative of Naphthalene Deposits, and for the Automatic Cleaning of Mains and Services.
It is also used for the Enrichment of Gas.
Manufactured and Supplied by C. BOURNE, West Moor Chemical Works, KILLINGWORTH, or through his Agents, F. J. NICOL & CO., Pilgrim House, NEWCASTLE-ON-TYNE.
Telegrams: "DORIC," Newcastle-on-Tyne. National Telephone No. 2497.

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SPENT OXIDE PURCHASED.
BALE'S FIRE CEMENT.
PAINT FOR GAS-WORKS.
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THOMAS HORROCKS & SONS, LTD.,
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GRANT STREET, MILES PLATTING, MANCHESTER.
Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent Naphtha, Carbolic, Sulphate of Ammonia.

AMMONIA Waste Liquor Disposal.
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Results Guaranteed. No Working Costs.
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MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 & 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

FOR Renovating Cooking Utensils and Polishing Gas-Cookers and Gas-Fittings, read Canning's Handbook on Electro-Plating and Polishing. Fully illustrated, Price 2s. 3d., post free; abroad, 2s. 6d.
W. CANNING AND CO., BIRMINGHAM, and 18, St. John's Square, Clerkenwell, LONDON.

SULPHURIC ACID — Specially prepared for Sulphate of AMMONIA and BENZOL Recovery Plants. JOHN NICHOLSON & SONS, LTD., Hunslet Chemical Works, LEEDS. Tele.: "NICHOLSON, LEEDS." Telephone: (Two Lines) Nos. 2420 and 2421.

GAS-WORKS requiring Extensions should Communicate with FIRTH BLAKELEY, SONS, AND CO., LIMITED, Dewsbury, who make a Speciality of Catering for the Smaller Gas Concerns. Prices Reasonable; quality and results, the *best*. Satisfaction Guaranteed.

J. E. C. LORD, Ship Canal Tar-Works, Weaste, Manchester. Pitch, Creosote, Benzols, Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid, Carbolic Acid, Sulphate of Ammonia, &c.

GAS PLANT for Sale—We can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED, Church Fenton, near LEEDS.

SULPHATE OF AMMONIA SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants.
We Guarantee promptness with efficiency for Repairs.
JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.
Telegrams: "SATURATORS BOLTON." Telephone 0848.

HYDRATED OXIDE OF IRON.
PREPARED from Pure Iron.
Twice as rich as Bog Ore.
Gives no back Pressure.
The Cheapest in the Market.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

CRIPPS' "GUIDE-FRAMING OF GASHOLDERS."
ANY number of copies of this Book will be PURCHASED at a good price.
Inquiries to No. 5840, care of Mr. KING, 11, Bolt Court, FLEET STREET, E.C.

ROBERT DEMPSTER & SONS, Ltd., Contractors for Complete CARBONIZING PLANTS and every Description of GAS APPARATUS, ELEVATING, CONVEYING, and TELPHERAGE PLANTS, also STOKING MACHINERY, ROSE MOUNT IRONWORKS, ELLAND.

EXPERIENCED Buyer, attached to the Lighting and Glassware Department of a large Gablonz Export Firm, with thorough knowledge of the Manufacture and Prices of Bead Fringes, Shades, Prismatic Glass, and other similar Accessories, wants to Start and Manage for a Large Firm a Purchasing Branch in Gablonz. It will be very profitable for the Firm, because, for example, BEAD FRINGES WILL BE AT LEAST 25 PER CENT. CHEAPER, and other Articles in the same Line.

Address, No. 5841, care of Mr. KING, 11, Bolt Court, FLEET STREET, E.C.

MARGAM URBAN DISTRICT COUNCIL.

NEW GAS-WORKS.
APPOINTMENT OF GAS MANAGER.

THE Margam Urban District Council are prepared to receive APPLICATIONS for the Appointment of GAS MANAGER.

Salary, £250 per Annum.

The Person appointed will be required to enter upon the Duties at an early date, in order to Supervise the Erection of the New Works.

Applications, stating Age and Full Particulars of previous Experience, together with *copies* of Three recent Testimonials, to be sent to the undersigned on or before the 14th day of February, 1914.

D. E. JONES,
Clerk.

Port Talbot,
Jan. 28, 1914.

WANTED, an Experienced Working MANAGER to take Full Charge of the Gas-Works at Tetbury, Glos. (Annual Make 8¾ Millions). Must be Competent, Steady, and have a Thorough Knowledge of the Manufacture of Coal Gas, Setting of Retorts, Laying of Mains and Services, Fitting Cooking Stoves, Reading Meters, &c. House, Coal, Gas, Rates, and Water Free.

Apply, by letter, stating Age, Experience, and Wages required, and Enclosing *copies* of Testimonials from present and last Employers, to Mr. MAURICE J. PRIDE, Secretary, Tetbury Gas Company, Limited, TETBURY, Glos.

THE Devon Gas Association, Limited, require the Services of a Single Man as GAS-FITTER (Compo. and Iron) and RELIEF-MANAGER for their various Works. Permanent Employment and Prospect of Management of Small Works later.

Apply, stating Wages Required and Experience, to the DEVON GAS ASSOCIATION, LIMITED, Haven Road, EXETER.

SMART Junior Salesman required for Show-Rooms. Must have had previous Experience and be of Smart Appearance.

Apply, giving full Particulars and Age, and stating present Salary, to T. W. LUCKHURST, Secretary, Weston-super-Mare Gaslight Company, 32, Boulevard, WESTON-SUPER-MARE.

WANTED—Leading Stoker, for a 25-Million Works, Isle of Wight. An Experienced Carbonizer and Good Shovel-Charger. Wages, 34s. per Week.

Apply, with Reference, to No. 5843, care of Mr. KING, 11, Bolt Court, FLEET STREET, E.C.

CONDENSERS Wanted. Set of Four or Six ANNULAR CONDENSERS with 10-inch or 12-inch Connections.

Offers to No. 5842, care of Mr. KING, 11, Bolt Court, FLEET STREET, E.C.

GAS-WORKS.—Wanted to Purchase, for Cash, a Small GAS-WORKS. Preference given to one where there is Scope for Further Development.

Write, giving full Particulars, to "D. G.," SCRIPPS'S ADVERTISING OFFICES, 13, SOUTH MOLTON STREET, W.

FOR SALE.—One Complete Set of BLOWING PLANT suitable for Carburetted Water-Gas Manufacture (400,000 cubic feet per 24 Hours), Plant consists of High-Speed STEAM-ENGINE (Cylinder 8½ inches diameter by 12-inch stroke) by Marshalls, Gainsborough; STURTEVANT BLOWER; COUNTERSHAFTING, with Pulleys, Brackets, Driving Belts, &c.

The Plant is in First-Class Condition, and can be Inspected at the GAS-WORKS, Seamer Road, SCARBOROUGH. Offers invited.

Further Information on Application to the ENGINEER and MANAGER, Gas Offices, SCARBOROUGH.

FOR SALE—A Cast-Iron Tank 44 feet diameter by 18 feet deep, with Cast-Iron Columns and Lattice Girders forming Guide-Framing for Telescopic Gasholder; also Two-Lift GASHOLDER and 8 in. Inlet and Outlet Pipes, Syphons, &c. Also Four PURIFIERS, 16 ft. by 16 ft. by 5 ft., with 14-inch Valves and Connections; and One 10-inch STATION GOVERNOR.

For Particulars, apply to the MANAGER, Gas-Works, Romford, ESSEX.

WALLER'S Patent Exhauster, 1907 Make, Passing 250,000 cubic feet per Hour, 20-inch Connections. Cheap for Quick Sale.

Apply to No. 5892, care of Mr. KING, 11, Bolt Court, FLEET STREET, E.C.

TENDERS are invited for 22 in. by 16 in. D-RETORT MOUTHPIECES.

Full Particulars on Application to the undersigned. Tenders not later than Feb. 14, 1914.

W. S. HADDOCK,
General Manager.

Gas Offices, Warrington.

COUNTY BOROUGH OF HALIFAX.

THE Gas-Works Committee of the Halifax Corporation invite TENDERS for the Supply of: (1) BUXTON LIME, (2) SULPHURIC ACID, (3) OXIDE OF IRON, (4) TARRED GASKIN, (5) BRASS LAMP FITTINGS, (6) BRUSHES, (7) IRONMONGERY, (8) WET AND DRY GAS-METERS, (9) CAST-IRON PIPES, (10) IRON VALVES AND CONNECTIONS, (11) STEEL GOODS, (12) WROUGHT-IRON TUBES AND FITTINGS, (13) IRREGULAR PIPES AND CASTINGS, (14) FIRE-CLAY GOODS, (15) OILS, PAINTS, &c., (16) BRASS MAIN COCKS, (17) CLEANING WASTE, (18) TIMBER, (19) GALVANIZED IRON AND TIN SHEETS, (20) CANDLES, TAPERS, MATCHES, LARD, SOAP, &c., and for the PURCHASE of SCRAP METAL and SPENT OXIDE OF IRON, during the Twelve Months ending the 31st of March, 1915.

Forms of Tender and further Information may be obtained on Application to Mr. W. B. McLusky, Engineer, Gas-Works, Halifax.

Tenders, properly endorsed, together with the word "Gas-Works," must be sent to the undersigned not later than Twelve o'clock noon on Wednesday, 18th of February, 1914.

The persons whose Tenders are accepted for the Supply of the above-mentioned Articles will be required to observe the Fair-Contracts Clauses adopted by the Corporation.

The Committee do not bind themselves to accept the lowest or any Tender.

By order,
PERCY SAUNDERS,
Town Clerk.

Town Hall, Halifax,
Jan. 30, 1914.

COUNTY BOROUGH OF BARROW-IN-FURNESS.

THE Corporation are prepared to receive TENDERS for the Supply of FIRE-BRICKS, CAST-IRON PIPES, WROUGHT-IRON TUBES and FITTINGS, BRASS COCKS, GAS-METERS, GAS-COOKERS, OIL, LIME, IRONMONGERY, and SULPHURIC ACID, as may be required from the 1st day of April next to the 31st day of March, 1915.

Sealed Tenders, on Forms to be obtained at the Office of the Manager of the Gas and Water Works, addressed to the Chairman of the Gas and Water Committee, and endorsed "Tender for Stores," to be Delivered at the Town Clerk's Office on or before Tuesday, the 17th day of February, 1914.

The lowest or any Tender not necessarily accepted.

By order,
L. HOWLETT,
Town Clerk.

Town Hall, Barrow-in-Furness.

BOROUGH OF LANCASTER.

THE Corporation Gas Committee hereby invite TENDERS for the Supply of 24,000 Tons of Rough, Caking, GAS SLACK, to be Delivered at their Gas-Works, St. George's Quay, Lancaster, extending over a period of Twelve Months, from the 1st day of April, 1914, to the 31st day of March, 1915.

Tenders, endorsed "Gas Coal," to be Delivered to the Town Clerk, Lancaster, not later than the 14th day of February next.

Forms of Tender may be had on Application to the undersigned.

C. ARMITAGE, Assoc.M.Inst., C.E.,
Engineer and Manager.

URBAN DISTRICT OF MILFORD HAVEN.

TENDERS FOR GAS, CANNEL, ANTHRACITE, AND STEAM COAL.

THE Milford Haven Urban District Council are prepared to receive TENDERS for the Supply of the following COALS—viz.:

1500 Tons of LARGE GAS,
500 " " LARGE CANNEL,
80 " " ANTHRACITE WASHED BEANS,
50 " " LARGE STEAM.

To be Delivered between the 1st of April, 1914, and the 31st of March, 1915, the whole of the Coal to be Fresh Hewn, Clean, and free from all Impurities.

Further Particulars and Forms of Tender can be obtained on Application to the undersigned.

Sealed Tenders, endorsed as follows:—

1.—"Tender for Gas, Cannel, and Anthracite Coal," addressed to the Chairman, Gas and Water Works Committee.

2.—"Tender for Steam Coal," addressed to the Chairman, Highways, Lighting, and Public Improvements Committee.

To be sent in not later than the 14th of February next.

The Council do not bind themselves to accept the lowest or any Tender.

By order,
THOMAS H. LEWIS,
Clerk.

Milford Haven, Jan. 28, 1914.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION of NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

BOURNEMOUTH GAS AND WATER COMPANY.

NEW ISSUE OF 2000 £10 SIX PER CENT. PREFERENCE SHARES.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, Tokenhouse Yard, E.C., on Tuesday, Feb. 24, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

THE Proprietors of the Patent No. 8178 of 1910, for "METHOD OF, AND APPARATUS FOR, PRODUCING GAS," are desirous of entering into Arrangements, by way of LICENCE and otherwise, on reasonable Terms, for the purpose of EXPLOITING the same and ensuring its Full Development and Practical Working in this Country.

All Communications, to HASELTINE, LAKE, and Co., Chartered Patent Agents and Consulting Engineers, 28, Southampton Buildings, Chancery Lane, LONDON, W.C.

BRENTFORD GAS COMPANY.

NOTICE is Hereby Given that a Half- YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at St. Ermin's Hotel, Caxton Street, Westminster, on Friday, the 13th of February, at Half-past Two o'clock, precisely, to Transact the usual Business, including the Declaration of a Dividend for the Half Year ending the 31st day of December last; and to Elect Directors and Auditors in the place of those who will at such meeting go out of Office, in accordance with the Company's Acts of Parliament.

AND NOTICE IS HEREBY FURTHER GIVEN that a SPECIAL MEETING of the Proprietors of the Brentford Gas Company will be held at St. Ermin's Hotel, Caxton Street, Westminster, on Friday, the 13th day of February, at Three o'clock in the afternoon, for the purpose of considering, and, if thought fit, approving, First the Bill proposed to be introduced into Parliament, intituled—"A Bill to Consolidate and Convert the Capital of the Brentford Gas Company, to Authorize the Acquisition by the Brentford Gas Company of the Undertakings of the Staines and Egham District Gas and Coke Company, Limited, and the Sunbury Gas Consumers' Company, Limited, to Confer Further Powers on the Brentford Gas Company, and for Other Purposes" and, Secondly, agreements for the acquisition of the above-mentioned undertakings.

The Dividends to be declared will be paid to the holders of Preference and Ordinary Stocks registered as Stockholders on the 8th of January, when the TRANSFER BOOKS were CLOSED.

By order of the Directors,
JOHN T. CROXFORD,
Secretary.

Office, Brentford,
Jan. 26, 1914.

BRIGHTON AND HOVE GENERAL GAS COMPANY.

NOTICE is Hereby Given, that the HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors will be held at the Company's Offices, No. 5, Great Winchester Street, Old Broad Street, in the City of London, on Friday, the 20th of February, 1914, at Two o'clock p.m. precisely, to receive the Report of the Directors and the Accounts of the Company for the Half Year ended the 31st of December, 1913; to declare Dividends; to elect Two Directors; to elect Auditors and to appoint a Special Auditor; and for other purposes.

The TRANSFER BOOKS of the Company WILL BE CLOSED from the 7th to the 20th of February, both days inclusive.

ERNEST L. BURTON,
Secretary.

5, Great Winchester Street,
Old Broad Street, London, E.C.,
Feb. 2, 1914.

HORLEY DISTRICT GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Great Eastern Hotel, Bishopsgate Street Entrance, London, E.C., on Thursday, the 26th day of February, 1914, at 3.30 o'clock precisely in the Afternoon, to receive the Directors' Report and Statement of Accounts for the Half Year ended the 31st of December, 1913; to declare a Dividend for the same period; to elect one Director and one Auditor; and to transact the General Business of the Company.

The TRANSFER BOOKS of the Company WILL BE CLOSED from the 19th day of February 1914, to the 5th day of March, 1914, both days inclusive.

By order of the Board,
R. SEYMOUR TOBEY,
Secretary.

Gas Offices, Station Road,
Horley, Surrey, Jan. 15, 1914.